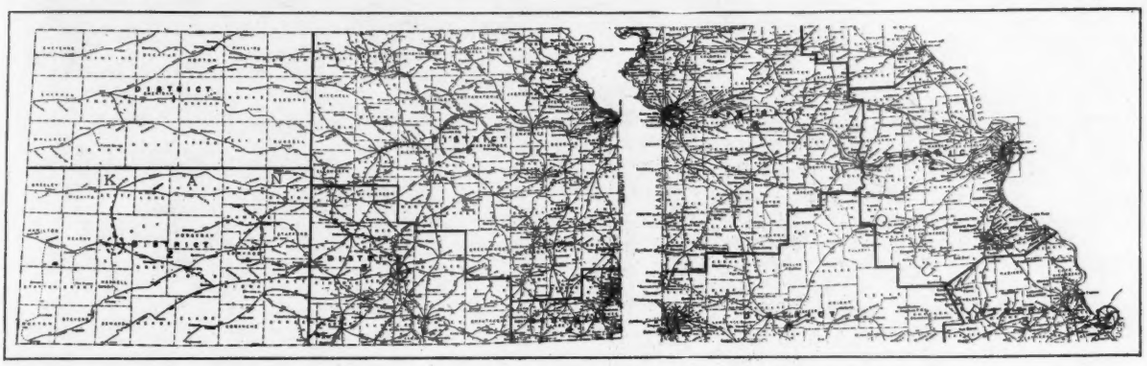
Electrical Review

VOL. 78—No. 18. CHICAGO, SATURDAY, APRIL 30, 1921. PAGE 683.



Map of the States of Kansas and Missouri, Divided Into Tentative Power Zones for Centralization of Electrical Generating Equipment.

Economic Generation of Electricity by Power Zones

Concentration of Electrical Generating Equipment at Centers of Naturally Divided Districts With Facilities for Fuel or Water-Power Production and Transmission at Minimum Cost

By H. H. KUHN

Kansas City Power & Light Co., Kansas City, Mo.

The concentration of generating equipment at centers of economical production and transmission is a subject which is very important at this time as it is along the line of study now being made by the Geological Department of the United States Government through a committee on a super-power zone for the Atlantic seaboard, and furthermore, if the proposed plan here submitted is carried out it will be the salvation of the small electric utility companies throughout the states of Missouri and Kansas. The geological and industrial conditions of the Midwest are such that it will be impossible to carry out the exact plan as outlined for the Atlantic seaboard and these conditions will necessitate the concentration of the generating equipment at points of economical production and transmission, which points are along the Missouri and Mississippi rivers.

The term "Isolated Stations" will be used herewith in referring to the small central stations in the different communities throughout the states of Missouri and Kansas.

The map as shown herewith is a prophecy of the future. It is an attempt to illustrate what is meant by centers of economical production and transmission. The writer has selected what can be considered as ideal locations for the large central stations and has arbitrarily divided the territory among the several stations. The boundary lines of the districts that would be served from the several centers of production may be subject to change but the centers of production are fixed by the conditions which enter into their selection. It will be noted from the map that the states of Missouri and Kansas have been divided into five districts.

District 1, of Missouri, is the territory surrounding Keokuk, Ia. The Keokuk plant should supply the electric energy required in this district and the adjacent parts of Iowa and Illinois.

District 2, of Missouri, is that territory tributary to St. Louis, and the chief source of electric energy for this district should be the plants of the Union Electric Co. of St. Louis, and due to their size and favorable location they should be able to produce and distribute electric energy throughout this territory at a rate below the production cost of the isolated stations.

District 3 is a small section of southeast Missouri which might be supplied from St. Louis, or preferably from some plant which in the future will undoubtedly be located near the junction of the Ohio and Mississippi rivers.

District 4 is that section of Missouri which includes the Ozark mountains and is the only district of the state where there is a possibility of economical development of water power. The plant of the Ozark Power & Water Co., on the

White river, which supplies electric energy to the Empire District Electric Co. is the initial important installation. It is permissible to assume that any future developments in this region would only supply additional power to the lines of the Empire District Electric Co. which should distribute this power throughout District 4, of Missouri and Kansas.

District 5 is that portion of the state of Missouri which is tributary to Kansas City, and in allotting this territory to Kansas City it is entirely within reason and practical to consider this district as dependent on Kansas City for its chief source of electric energy.

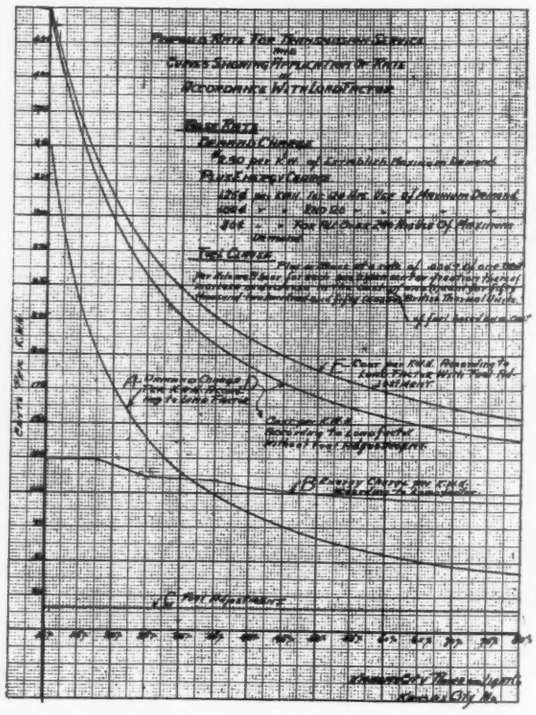


Chart for Determination of Centralized Service Rates.

District 1, of Kansas, is in the northwest section of the state and is very sparsely settled. The industrial activities are so limited and the distances so great between the communities to be served that it will be necessary to continue to depend on the isolated station until such time as the electrification of railroads takes place at which time it will be logical to consider the construction of a large central station.

District 2, of Kansas, is the southwest section of the state and it is possible that it will be more economical to produce the required electric energy for this district in one large station than to depend on the isolated stations. The industrial demand for electric energy is very small, but there is and will continue to be an increasing demand for power for irrigation purposes in certain parts of this district where there are large underground flows of water.

District 3, of Kansas, is that territory adjacent to Wichita and it should be supplied from this center, although it is possible some plan of interconnection might be worked out whereby the off-peak load of this district and the future increased demand might be supplied more economically from Kansas City than it can be produced at Wichita.

District 4, of Kansas, is the southwest section of the state; it is rightfully a part of District 4, of Missouri, and should be supplied from the same source.

District 5 is the northeast section of the state of Kansas and is the territory tributary to Kansas City, and this district should depend upon the stations of the Kansas City Power & Light Co. for electrical energy to light the homes and keep the wheels of its industries turning.

Kansas City District Taken as Fair Example of Plan.

We will take as an example District No. 5, which consists of parts of Missouri and Kansas with the center at Kansas City, which is one of such favorable locations. The Kansas City Power & Light Co.'s Northeast Station, whose thermal efficiency is second to none, is the initial installation of such a station as will be required to serve the district surrounding Kansas City. The writer's work with the Kansas City Power & Light Co. has been such that he has gained an intimate knowledge of the surrounding territory and finds from a study of the conditions which make for economical production, distribution and transmission, that the prospective territory which should be supplied from this center, as shown by the map, extends to Jefferson City, Columbia and Moberly on the east; Wichita, Salina and Concordia on the west; Fort Scott and Nevada on the south, and the Missouri and Kansas lines on the north. There is no other point in this district where power can be produced as cheaply and distributed more economically.

There must always be ample generating capacity to carry the peak load of the district and, due to the fact that the living and industrial conditions in the small towns are different from those of a large city such as Kansas City, the peak load of the small towns will come at some period of the day other than the time of the peak load in Kansas City. This diversity will smooth out the load curve, require less generating equipment and permit of more economical production of electric energy.

The following points must be considered when carrying out a plan such as here proposed:

1. The quality and quantity of water available.
2. The cost and kind of fuel available.
3. The assurance of an adequate supply of fuel and its transportation.
4. The load now served by the present isolated stations.
5. The potential load of the communities tributary to the proposed station.
6. The percentage of the potential load that would finally be connected to the proposed station by transmission lines.
7. The prospective additional load which might develop in the territory to be served from a proposed central station.
8. The cost of transmission lines required to distribute the electrical energy.
9. The rate for service to companies receiving electric energy from the proposed central station.

Let us see how well Kansas City will qualify when judged by the nine essential points as stated above.

The Quality and Quantity of Water Available.—The quality of water is an important item as many companies have steam driven stations operating noncondensing and, therefore, are primarily

interested in the kind of water that is available for boiler feed, while with the Kansas City company the quantity of water available is of greatest importance. The development of the modern steam turbine necessitates an immense amount of water for condensing purposes and one cannot conceive of locating a large generating station at a point other than where water is available in unlimited quantities. The quantity of water will never trouble the Kansas City Power & Light Co. as it has the entire volume of the Missouri river to draw from.

The thermal efficiency of the present condensing type of steam turbines with a capacity of 30,000 to 100,000 hp. is so high when compared to that of the simple or compound engines, or the small turbines which are used in the isolated generating stations in this territory, that we can very readily see the end of such generating stations except in those communities so far removed from the others by distance or other physical barriers that it would be impractical to attempt to render transmission service.

The present capacity of our Northeast Station in Kansas City is 60,000 kw. and on a summer day, at the rated capacity, it will pump 150,000,000 gals. of water through the condensers, which is more than the entire city of Kansas City and the neighboring communities will use in the same period. The management of the Kansas City Power & Light Co. feels that its present Northeast Station is the initial installation of a station which should supply all of the territory surrounding Kansas City, as shown by the map. It is the hope of the company officials to be able within the next few years, and as rapidly as money conditions will warrant, to increase the capacity of the Northeast Station and extend its transmission line throughout District 5.

Centralization of Production Will Solve Fuel Problem.

The Cost and Kind of Fuel Available.—The question of fuel and the maintenance of an adequate supply has always been one of the serious problems. The purchasing and handling of fuel is a problem in itself and in many cases it has been a question as to what to buy, when to buy and what one should pay, because we were not accurately informed as to the true conditions of the coal market. Transmission service will therefore remove one of the greatest cares. The centralization of the production of electrical energy will also centralize the handling of fuel so that it will be in the hands of men whose business it is to keep their fingers on the pulse of the coal trade, and the production of electrical energy will reap the benefits from a scientific handling of the fuel problem. Every generating station requires an emergency fuel supply as a reserve against strikes, bad weather and other causes tending to interrupt the supply of fuel. The physical properties of steam coal which is available for use in this territory are such that it cannot be stored except under the most favorable conditions, and then only for very short periods at the end of which time it is necessary to burn the coal or suffer its loss due to spontaneous combustion which invariably occurs after the coal has been in storage for some weeks. The moving of coal by hand is very expensive, and it is not unusual for it to cost those companies following that method from $0.50 to $2 a ton to handle and store coal. The Kansas City Power & Light Co., due to the fact that it handles a vast amount of coal daily with the most modern equipment at hand, is able to store coal for a short period at a cost of about $0.10 a ton to cover the expense of unloading and reloading when it becomes necessary to burn the coal which has been in storage and replace it by fresh coal so as to maintain the necessary reserve supply.

The Assurance and Transportation of an Adequate Supply of Fuel.—Kansas City is one of the largest railroad centers in this country, and with the assistance of 14 railroads, one or more of which tap the coal fields of Illinois, Iowa, Missouri, Kansas, Oklahoma and Arkansas and the oil fields of Kansas, Oklahoma and Texas, there is every reason to believe that the fuel supply for a large generating station in Kansas City will always be assured. Public opinion would not permit a mine strike or other strike to interfere with the delivery of fuel required in the operation of a large generating station supplying electricity to practically every home within a radius of 125 mi. of Kansas City. A diversity of the fuel supply such as is mentioned above is of vital importance and the company is not dependent on any one coal field, or coal at all, as we can always change to fuel oil when it is cheap or necessity demands that we do so. This combination assures an adequate supply of fuel at fair prices.

The Load Now Served by the Present Isolated Stations.—The load now served by the utility companies throughout the territory surrounding Kansas City is about 25% of the potential load of this district. The present loads consist mostly of residence and business lighting, street lighting and a certain amount of small power and occasionally some few of the larger users of power.

Leading industry in many cases has a larger power demand than the capacity which is available in the plant of the local utility. A condition such as that precludes any dealings with that industry because its load could not be handled; or if the capacity of the utility plant was increased the necessary rate for the service would make the purchase of energy unattractive as the production cost of the utility company would not be materially less than that of the prospective purchaser.

The flexibility of transmission service will permit the handling of all business available in the community and any additional business that is desirous of locating therein. It eliminates the necessity of making the large investment in generating equipment which would be a dead loss should the power requirements of the community suffer a permanent decrease due to a change in industrial conditions. An increase in the power requirements of a community served from a transmission line only requires additional transformer capacity and the necessary changes in the local distribution system, all of which under normal conditions can be made in from 60 to 90 days.

The Potential Load of the Communities Tributary to the Proposed Station.—This is from two to three times the present demand on all generating stations in that district and consists of every local industry now operating its own plant, the refrigerating load, the water pumping load and the rural lighting, cooking and power load which is available for the utility companies on terms

that will be profitable to the utility and at the same time appeal to the farmer. The railroads are a potential load for the large station and inside of 10 yrs. some of the leading railroads in this district will be electrified or seriously considering the question.

The electrification of railroads is a problem in itself and will require additional transmission lines which will reinforce the transmission lines that are now being constructed to render service to our companies. It will be just as impractical for the railroads to attempt to generate their own power in competition with the present and future Kansas City stations, as it is for the small isolated company to generate its power in competition with the present Northeast Station.

Percentage of Potential Load Possibilities Under Zone Operation.

The Percentage of the Potential Load That Would Finally Be Connected to the Proposed Station by Transmission Lines.—Either direct or through the local distributing companies this percentage is dependent upon representatives of the public utilities. It will mean in many cases a long pull to convince some of the folly of attempting to compete with your power proposition under this plan, and there are a few industries which may have process work which will preclude the purchase of power although with the increasing price of fuel it may be possible to out-figure such competition. There will be a few in each community who may say that, "Regardless of cost, we want our own plant as a plaything."

It might be well at this point to give a little comparison of the difference in the efficiency of the Kansas City station and the average station in the communities we propose to serve. We are able to obtain a kilowatt-hour for approximately 20,000 B.t.u., or approximately 2 lbs. of coal, while the average isolated station uses from 60,000 to 100,000 B.t.u. or approximately 6 to 10 lbs. of coal to accomplish the same result. The difference in efficiency is a relative difference between 2 lbs. and 6 to 10 lbs. of coal. Assuming the smallest difference which is 4 lbs. of coal, one can very readily see what the result would be from the concentration of generating equipment at centers of economical production and transmission, as such stations will be able to produce from three to five times as many kw-hrs. with the same amount of fuel as used by the isolated stations. It is the operation of such inefficient stations and their increased demand for fuel, due to their increased output, that has helped to increase the price of fuel and it can very readily be seen that our plan would tend to lower the demand for fuel until such time as our company, with your assistance, would be able to increase the use of electric energy from three to five times the present total requirements. In doing so we would eliminate a vast number of inefficient steam-driven industrial plants, thereby further decreasing the demand for fuel.

It is not intended to convey the thought that the inefficiency spoken of here is due to lack of knowledge or proper supervision on the part of other companies, for results obtained are dependent entirely upon equipment and the load-factor of the station. A fuel consumption of 6 lbs. of coal per kw-hr. is in most cases, when all factors are considered, a very good result although when the rate of coal consumption approaches 10 lbs. of coal per kw-hr. there is undoubtedly some room for improvement.

The Prospective Additional Load Which Might Develop in the District to Be Served from a Proposed Central Station is dependent upon the industrial growth of the country and is a study in economics. This factor is one which will take care of itself as it is not spontaneous, and in any community immediate provision can be made to handle additional business by changing the size of the transformation equipment, provided the community is receiving transmission service.

The Cost of Transmission Lines Required to Distribute the Electrical Energy.—The fixed charges of interest, taxes and depreciation on the investment in transmission lines, the operating and maintenance expenses, the production expenses and a fair profit must give a resultant rate per kw-hr. for all energy delivered which is less than the per kw-hr. switchboard cost of the isolated stations in order that the transmission company may do business with the local companies. There is every reason to believe that the available business now connected to the local systems, plus a reasonable percentage of the potential business, will warrant the building of a large transmission system to serve District No. 5, and when the entire load has been connected to the transmission lines additional supply lines can be constructed and maintained so that there will be more than one source of supply. These additional supply lines will put a loop system through the important distributing centers and in case of line failure or necessity of working on the lines a section can be cut out of service without interrupting the service to other communities.

The only factor now delaying the immediate construction of this system is obtaining money at a reasonable rate, as we feel that we can depend upon the active co-operation on the part of the companies and communities that will benefit from this policy. It means that in order to derive some of the benefits which will accrue we must carry on a campaign of education and enlightenment among our neighbors and patrons, and especially the bankers, to convince them of the possibilities and the advantages of this plan. This plan is going to require millions of dollars and the money is available in this district to consummate it provided the local bankers open their eyes to the advantages of high-class utility securities and place them among their patrons, which they can very readily do as in most cases they advise their patrons as to what is a good security in which to invest their surplus funds.

Determining Cost of Service Under Proposed Centralization.

The Rate for Service to Companies Receiving Electric Energy from the Proposed Central Station.—The transmission lines should be built so that they will not only handle the present load, but also all future business. In order to do this there will be a few lean years and the companies to be served must expect to pay a portion of the development expense in the rate which will be charged for transmission service. Rates for this service should consist of a maximum-demand charge and an energy charge. The maximum-

demand charge should cover the fixed charges of interest, taxes and depreciation on the investment in station equipment and transmission lines. The energy charge should cover production cost, transformation and transmission losses and the operating and maintenance expenses of the transmission system plus a fair profit.

There are three essential features which go to make up the resultant rate per kw-hr. for the energy which would be delivered under this form of rate. *A* is the demand charge, and curve *A* in the accompanying chart illustrates how it enters into the resultant rate. *B* is the energy charge as given. *C*, which is a straight line, is the correction charge for excess cost of fuel in accordance with the "Fuel Rider," and it is based on a fuel cost of 37,500 B.t.u. for $0.01. *D* is a combination of *A* and *B* and gives the resultant rate per kw-hr. if the fuel cost would be 50,250 B.t.u. for $0.01, the basis on which the rate was established. *E* shows the effect of a fuel rider which is only adding the straight-line value of *C* to the curve at *D*. If the load-factor of a company is 30%, which is the average load-factor in the smaller communities, the cost of power per kw-hr. as found from curve *E* will be $0.0247, and if a company has a load-factor of 60%, the cost as found from curve *E* will be $0.0172 per kw-hr., which is a difference of $0.0075 and not a bad profit per kw-hr.

A rate to be equitable must contain a fuel rider to protect the transmission company in case of a rise in the cost of fuel and to give the customers the benefit of any reduction in its cost below the basis on which the rate was established. There should also be a provision in all contracts so that the demand charge per kw. of maximum demand would vary with the increase or decrease in the investment per kw. of capacity in generating stations and transmission lines. A fuel rider is a provision which, when established on an equitable basis, should be incorporated in all power rates, and when such is done it will be found that there will be less rate trouble and no necessity of appearing before the public service commission.

What has been said about the local situation and surrounding district applies to the other districts and the country as a whole; and the fulfillment of this plan is dependent upon the attitude adopted towards it, the missionary work done among the investors of a community, the adoption of rates and methods that will build up business so that it is a factor to be considered, and the attitude of the public service commission, which it is believed will favor such a plan because it will tend to do what all public service commissions desire, and that is to reduce or maintain the present rates and at the same time enable all utility companies to earn a fair rate of return and a profit on the large investment that will be required to consummate this proposed plan.

Despite the view of some that the phrase is a big name which stands for a huge octopus, public utilities in reality are merely the unifying agency between man and the forces of nature. People need water and lighting facilities, they require telephone, telegraph and power service and they must have a means of transportation. Hence the introduction and evolution of the so-called public utilities.

BETTER UNDERSTANDING BETWEEN UTILITIES AND FARMERS.

Rural Power Problems Possible of Early Solution Through Co-operation and Mutual Understanding of Existing Conditions.

By S. W. Hill.

At the present time the utility companies of the country are beginning to realize that rural districts are demanding electric transmission lines as a means of securing electric light and power. Both the farmers and the utilities are looking for a solution of this great problem. This will not come like a flash of lightning, but more like the break of day—dawn and then daylight.

There are those who believe that the farmers' desire for electrical service is temporary and that when they come to realize under what conditions it is practical for them and profitable for the utilities to extend their service to the rural districts, where possibly not over two customers may be served in a mile, farmers will look for other means of solving these problems. This is a misconception. The farmer can afford and is willing to pay more for electrical service than those living in cities and towns. There never has been, and it is doubtful if there ever will be, any form of power developed which will so completely meet the needs of the farmers as does the electric motor. The farmers' problem is that of convenient transmission, owing to the scattered condition of his buildings and equipment, so arranged to lessen the fire hazard.

The demand for electrical service on the American farm is based upon economic reasons, and since this is true it places upon the utilities a duty which cannot well be set aside. They must face it. The financing of farm lines is a question which has been up for discussion by both the farmers and the utilities and seems to be a question of two parts. The first part includes the building of the rural lines and the furnishing of equipment and connections. The farmer in most instances knows that it is largely up to him to build these lines or to furnish the necessary finances for building them. The second part of the question involves the main transmission line, the powerhouse and its equipment.

It is claimed that the farmers' proportion of this essential expense is approximately $200 per farmer. The necessary money must be raised by the utilities, and it would seem no more than equitable, if this additional equipment is installed for the benefit of the farmer customers, that the money should come from the farmer.

If the farmers are to demand unusual and extraordinary service from the utilities they should be broad-minded and businesslike enough to understand that ways and means must be provided for financing these extensions.

Before the war when costs were low, utilities commissions were decreasing the rates and the masses lauded the commissions, but when conditions changed and costs were higher the commissions were called upon to raise the rates. Then it was that the commissions were condemned and became unpopular. In fact, commission regulation became a campaign issue in many states.

If it costs more money to produce manufac-

tured articles, then it costs more money to produce electrical energy, but the public-service company that out of necessity asked for an increase in rates was at once subjected to bitter attacks.

In many instances where lines are extended to the rural districts the farmers seem willing to pay for the construction of the line, but on account of this investment they feel that the utilities should make them the same rate as is granted to customers in the city. It is difficult for many people to understand the cause and meaning or even the existence of line and core losses incident to country transmission, and so they cannot see why they should pay for such items. These are the problems which are up for discussion at this time, and not the question of whether or not the farmers want the service.

It is believed that within a reasonable length of time the people will begin to understand some of the perplexing problems of the utilities and will look more generously upon them, at which time there is no question but that the utilities will be able to supply rural service and especially will this be true when the farmers become more familiar with electrical problems.

The whole problem seems to demand a campaign of education. This does not necessarily mean that the farmers need all the educating; it is simply a case of each understanding the other's business. The farmer should be better posted on conditions under which utilities are compelled to operate and the utilities should inform themselves as to just what the electrical requirements of the farmers are going to be in order to be able to render the best service. As soon as this has been accomplished the utilities will be looking for the farmer and the farmer will be in quest of the service of the utilities.

Farming today is a business requiring just as much science as any business in the world, and farmers are beginning to see that if they are to be a factor in this great business world they must learn the real meaning of the word co-operation. Co-operation will bring them to a better understanding of economic problems and will teach them that several different interests working together will produce more desired results than any other course they can pursue.

Electricity will take the automatic refrigerator to the farm, which means thousands of dollars to the farmers and dairymen, and a certain amount of business to the central station. The automatic refrigerator is among the desirable inventions for the use of rural residents. These machines have passed through their experimental stages and are proving wonderfully practical. They have done much to attract the farmers' attention to electricity as a means of power as it is the only power known which will operate an automatic ice machine properly and safely.

Electric power is the only known energy which may be conveniently carried to every corner of the farm. It lessens the fire hazard on the farm. This is one great question with the farmer, and he is almost helpless when fire breaks out on his farm without power and water pressure. The farm light and power problem is passing through its stages of experimentation. Electricians and contractors realize that farmers want this form of power but do not know in what form it is wanted. But it is certain that they want it in some practical and economical form, and there must be some practical way of getting it there.

There are hundreds of contracting concerns springing up all over the country that are looking to farm electricity as their means of existence. There are as many different methods in vogue as there are contractors, and until all parties—the contractors, the farmers and the utilities—get together and make a study of farm electricity in order to find out something about the actual requirements, real progress will be delayed.

The conclusion is, therefore, that the farmer is trying to secure service which he knows little or nothing about; the contractor is trying to get the business of wiring the farm when he does not know the requirements of the farm, and the utilities are trying to get the farmer to see and understand their many problems. A better understanding of the whole problem by all is what is really needed.

ELECTRIC LIGHT INVADING SPHERE OF MIDNIGHT SUN.

The Midnight Sun has outlived its usefulness. Up in the dark cold regions of the Northland, where the natives formerly were content to grope around in the darkness, 20 to 22 hrs. daily during the months of November, December and January, today the aurora borealis is not a whit more wonderful to the Eskimos and their youngsters than the welcome radiance of electric light. It will be many a year before the public-utility companies invade the realm of the totem pole, the glacier and the igloo; but in the meantime, the farm plant, that contrivance of storage batteries and the like, which has been supplying the farmers of the rural West and Canada with power and light during recent years has begun to make its appearance.

One of the pioneer lighting outfits of the Arctic area was installed recently at the Kodiak Baptist Mission on Kodiak Island, just to the south of Cook Inlet, Alaska. C. D. Longmuir, a power and light expert of the Western Electric Co., played the solar role, introducing the apparatus that is now giving 24 hrs. of real light each day to the hundreds of Aleutian children who are being taught and cared for at the home and industrial school of the Women's American Baptist Home Mission Society.

UTILITY RATES MUST INCREASE AS COMMODITIES CHEAPEN.

Commodity prices throughout the United States are taking a long downhill slide, but when they reach the end of the drop they will still be from 75 to 90% above the pre-war levels, according to Harold Almert, Chicago consulting engineer and statistician, who spoke recently before members of the Optimists Club in Milwaukee. "Prices are coming down to what we may call the 'new high level,'" said Mr. Almert. "Prices of commodities that went up to an average of 260% above the pre-war mark will come down. Other prices, like public utility prices, which remained practically stationary during the war, must come up to the new high level before the readjustment is complete."

Electricity as a Factor in Ship-Repair Work

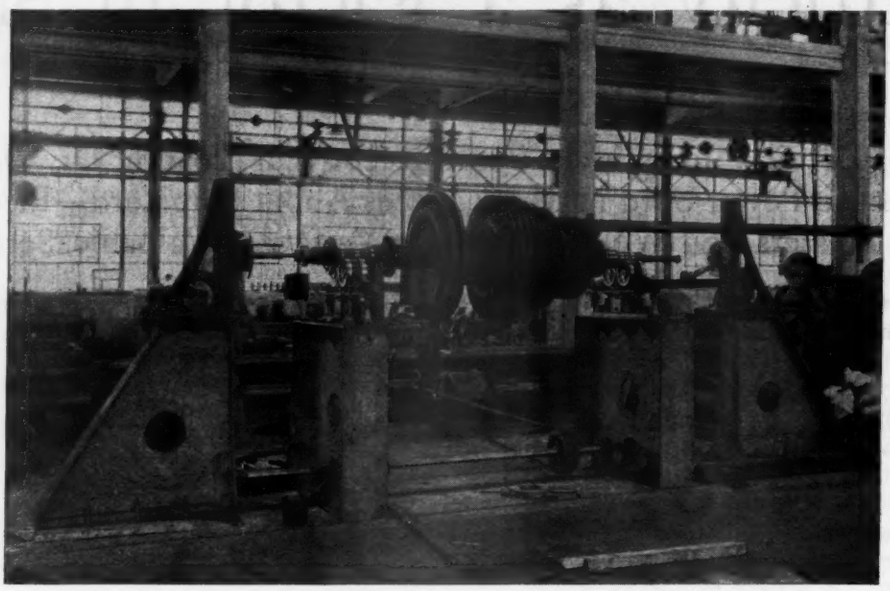
Motor-Driven Pumps Make Speed Records in Floating Dry Docks —Electric Power Used in Many Places About Ship Yard—Electric Rivet Heaters and Welders Perform Variety of Valuable Services

While American ship builders are doing their part in producing the ships, while American business interests are establishing trade routes to all parts of the world, and while American manufacturers and importers are building up a vast foreign business the ship-repair yards of the country are performing a function without which this whole structure of commerce would collapse. While all these other interests unite to "put the flag upon the seas" it is the ship-repair yard that keeps it there. A homely parallel is seen in the automobile—American manufacturers are building thousands of cars, but without the garage and its force of skilled mechanics even the best of machines would soon disappear from our highways.

Among all the great industries centering around our great ports one of the most important is that of repairing and rebuilding ships. There are yards which specialize in the repair of small boats and pleasure craft and yards which keep the harbor vessels in condition. The New York navy yard in Brooklyn is one of the most important naval bases in the country, while along the South Brooklyn water-front and on the Hudson river there are the several big plants which re-condition the ships of our mercantile marine. In these yards may be found vessels of every size and type hailing from every port in the world—all, for the time being, undergoing repairs. On one vessel the steamfitters may be installing new equipment in the engine room; in another part of the yard a ship stands high in a floating drydock while painters clean and paint her hull; in midstream a fleet of puffing tugs labors with a great freighter whose bow has been stove in by collision.

Interest of the shipping and electrical world, as well as that of the winter-resort traveling public, has focused itself this winter on the *S S Cuba,* plying between Jacksonville, Fla., and Havana. Travelers are interested because the vessel offers a new route to the Cuban capital; shipping men and electrical engineers are interested because the vessel is the first passenger craft to be operated entirely by electricity. Additional interest is due to the fact that what is now a luxuriously equipped speedy floating palace once lay at the bottom of Chesapeake Bay an abandoned hulk. She was raised when the war made such insistent

Waterfront of Morse Dry Dock and Repair Co., Showing Electric-Pump Control Station in Foreground.



Ackamoff Gear Used to Determine Balance of Turbines and Other Rotating Parts.

demands for more vessels, and was on her way north when hostilities ceased.

Modern Electric Ship Once a Battered and Neglected Wreck.

The transition from a rusty, battered hulk to a passenger steamer of the most modern type indicates the capacity and resources of New York's great shipyards, for the work was done by the

"SS. New York" in Dry Dock Raised by Means of Electric Pumps.

Morse Dry Dock & Repair Co. in its South Brooklyn plant. Additional interest attaches to this particular company for the reason that all through the vast plant the work is carried on by means of electric motors, and that central-station energy from the mains of the Brooklyn Edison Co. is used throughout the entire works. In other words, with the best engineering skill available this shipyard finds it more satisfactory and economical to purchase energy from the central station than to operate its own generating plant.

The Morse yard extends for several blocks along the waterfront, with a main entrance at 56th street and First avenue. It has very aptly been called a city within itself, for not only does it have its broad well-paved thoroughfares, and its departments for the production of practically every item that goes into ship repairing, but it has a fire department, a police department, a street-lighting system, a fleet of tug-boats, a hospital, and even a band organized by the employes. A printing plant produces all the company's printed matter.

Electric Pumps Empty Dry Docks to Raise Ships.

From the viewpoint of the spectacular there is probably no single operation in a shipyard that has quite the appeal as the dry-docking of a huge vessel. The docks are of the floating type, and raising a vessel means not only warping her into the dock, but raising both the dock and the hull. There are two such dry docks at the Morse yard. Dock No. 2, with a capacity of 30,000 tons and built in six sections, is the largest of the kind in the world. Ships up to 700 ft. in length can be accommodated, while for smaller vessels the sections can be operated separately. Some impressive records have been made by this dock. The *Minnesota*, the world's largest cargo ship, was raised in 25 min., the American liner *New York* was lifted out of the water in 18 min., and the *Powhatan*, now the *Cuba*, was raised in 22 min.

For lowering the dock to receive a ship the valves are opened and the water flows in. Then the ship is warped in and, when she is over the keel blocks, the pumps take up their task of forc-

ing the water out of the dock bulkheads and the dock and the vessel rise together.

While the docking operation may be the first to attract the visitor, the other departments are just as important to the work of the yard. In the plate shop one will find a powerful overhead elec-

Electric Heater for Rivets, Shown at Right.

tric crane that carries heavy sheets of steel to the various machines; a rattle, like musketry fire, is nothing more alarming than the great number of rivet hammers and drills; a great jawed machine spends its whole day biting through steel plates with no more evident effort than a child exerts in cutting out a cardboard city. The rolling machine, an electric mangle and electric rivet heaters are important parts of the plate shop. The machine shop, in addition to lathes, grinders, drills, planers and slotters has an Ackamoff balancing gear for determining the static and dynamic balance of turbines or other rotating machinery. The forge shop and blacksmith shop all use electricity in various ways, while the woodworking department and pattern shop have equally complete equipment.

The importance of welding in repairing ships was conclusively shown in the restoration of the German liners during the war. Therefore it is not surprising to find the electric and acetylene welding department forming another of the important links in the modern shipyard.

Throughout all the vast and complicated system of ship work there is hardly a duty which is not being performed by electricity. Electricity as a dependable power is seen in its extensive use throughout the Morse yards; central-station service as a dependable source for a dependable power is seen in the use of energy from the lines of the local electric light and power company.

ELECTRIC PROPULSION APPLIED TO COAST-GUARD CUTTER.

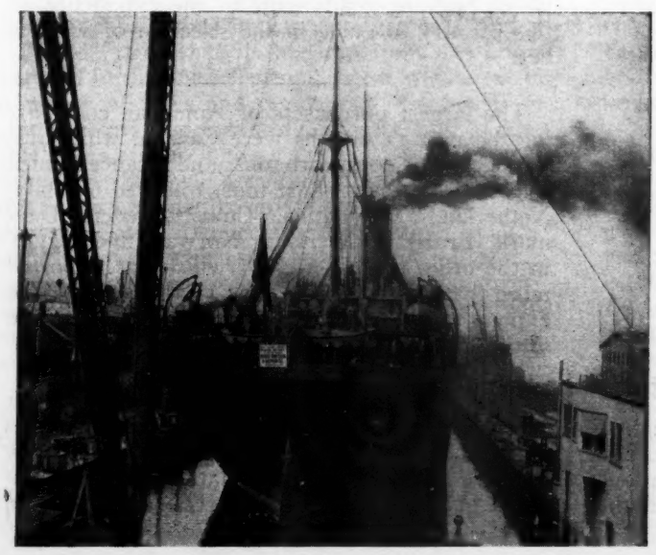
Government Craft First of Its Class to Be Electrically Equipped—Description of Installation and Economic Advantages.

By C. D. Wagoner,
General Electric Co., Schenectady, N. Y.

The highly successful results of the application of electricity as the driving power in American battleships, passenger ships and cargo carriers has led to its adoption in a new field, the U. S. Coast Guard Service. The first vessel of this type to have electric propulsion machinery installed is the new *Tampa,* a 240-ft. cutter launched April 16 at Oakland, Calif. She will perpetuate the name of a boat that was lost while in active service in the great war. On Sept. 26, 1918, the first *Tampa* was sunk with all hands on board in Bristol Channel, presumably by a torpedo from an enemy submarine. The new *Tampa,* first of four electrically propelled cutters being built for the Government, is expected to develop a speed of 16 knots. She is 39 ft. wide and 25.5 ft. deep with a displacement of 1600 tons.

In addition to the many economical advantages of electric drive over steam engine propulsion, the new *Tampa* will be much easier to control and can be reversed in much quicker time than its predecessor, a feature of much importance in this type of boat which meets emergencies where quick maneuvering is essential. There is also the uniformity of propeller speed, which prevents "racing" of the propeller no matter how rough the sea may be or how often the stern may pitch out of the water. This is a matter of no small importance to the engineer during a storm since there is no need for him to be constantly on the alert to reduce the power when the propeller blades clear the water, and to increase it again when they go under. Then, too, there is the total lack of vibration, giving more comfort to those on board and reducing the hull strains.

The *Tampa's* main propulsion machinery con-



Electric Pumps Raised This Dry Dock With the "SS. Minnesota" in 25 Min.

sists of two oil-burning water tube boilers supplying steam to a Curtis steam turbine directly connected to an a-c. generator which supplies electric power to a synchronous motor of 2600 hp. The turbine speed is 3000 r.p.m. and the speed of the motor and propeller is 130 r.p.m., a speed reduction from the turbine-generator to the propeller of 23. This may not mean much to the layman until it is explained that the turbine is inherently a high-speed machine, whereas the ship's propeller is limited to a slow speed for high efficiency. The turbine speed therefore must be reduced, and here is where electricity comes in for efficiently reducing the turbine revolutions to that speed which best meets the requirements of the ship's propeller.

The control equipment consists of a control group and a control panel so arranged that it can be either operated electrically or in case of an emergency by hand. Two exciters, one being a spare unit, furnish current for the excitation of the generators and synchronous propulsion motor, and also power for driving various auxiliaries such as the blower motor, steering gear, the gypsy, radio apparatus, refrigerating plant, laundry and lighting equipment. The pioneers of the electric drive are so convinced of its superiority that they believe vessels without it will prove to be objects of as much curiosity in years to come as the quaint sailing craft of bygone days is to the present generation.

It was about 15 years ago that W. L. R. Emmet, consulting engineer of the General Electric Co., announced that electricity would provide the motive power for vessels of every description. Its first application was in 1907 when the principle was adapted to fire boats for the city of Chicago, and since then the General Electric Co. has applied electric propulsion to practically every class of ship.

A chronological order of the various steps in the evolution of the electric drive for ship propulsion in America, showing the General Electric Co. first in each instance, follows:

1912.—U. S. S. collier *Jupiter,* first naval vessel of any nation equipped with the electric drive, launched at Mare Island navy yards, San Francisco.

1917 (April)—U. S. S. *New Mexico,* first battleship of any nation with Emmet's principles applied, launched at New York navy yards.

1919 (October).—The *Mariner,* first fishing trawler, equipped with the Diesel-electric drive, put in service.

1920 (October).—S. S. *Eclipse,* first of 12 electric cargo boats put into service.

1920 (November).—S. S. *Cuba,* first electric passenger and freighter, put into service.

1921.—S. S. *Fordonian,* first cargo carrier equipped with Diesel-electric drive, put into service.

1921 (April).—The *Tampa,* first electric coast guard cutter, launched.

The four new coast guard cutters, including the *Tampa,* are being built for the U. S. Treasury Department by the Union Construction Co. of Oakland, Calif.

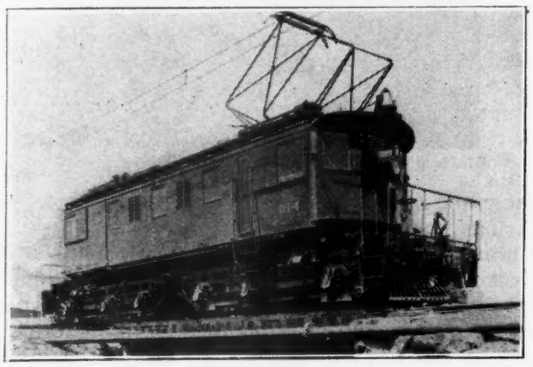
MOVE NATIONAL COUNCIL OFFICES.

The offices of the National Council of Lighting Fixture Manufacturers have been moved from 8410 Lake avenue to 231-233 Gordon Square building, Detroit avenue at West 65th street, Cleveland.

ELECTRIFICATION OF RAILROADS IN SOUTH AMERICA.

Modern Motive Power Finds Much Favor in Practical Way That Points to Extensive Future Development on Southern Continent.

Purchase of American electric locomotives for service in South America indicates that the people of that great continent are fully alive to the many advantages of this modern type of motive power. We in this country are not accustomed to thinking of our southern neighbors in any circumstances other than those pictured in the school books of our youth. And those old pictures are not at all in keeping with the actual picture as it should now be presented.



First Baldwin-Westinghouse Freight Locomotive for Paulista Railway Co., Brazil.

This marks a milestone in the electrification of one of the most important lines in South America. This is the initial step toward the broad application of natural resources of Brazil to the replacement of imported coal for power development. These locomotives are to be used in main-line freight service on the Paulista Railway, which is the main broad-gage trunk line of the most prosperous and productive part of the state of Sao Paulo. These freight locomotives weigh 105 metric tons and have six driving axles, each equipped with one 280-hp. d-c. motor, arranged for operation with two motors in series on the 3000-volt line. They are designed to handle trailing loads up to 700 metric tons over a line having a maximum grade of approximately 2%.

Rapid as has been the growth of South American industry, it is destined to develop at a vastly greater rate with the adoption of modern railway methods on old lines and the extensions on the same modern basis into new territory. South America has the opportunity—and she is grasping it—of building roads with all the experience of this country to guide in the selection of what is best.

The largest purchasers of American coal during the past 11 months were Canada, which imported 19,305,000 short tons, and France, which imported 3,910,377 short tons, followed by Italy, Netherlands, Argentina, Cuba, Sweden, Denmark, Brazil, Switzerland, Norway, and Egypt, in the order named, each of which has imported more than 600,000 short tons (Table AA). The exports during the first 11 months of 1920 are at the rate of about 44,000,000 tons per annum.

If a horse could deliver horsepower, then it would take 19,000,000 of the 23,000,000 horses in the United States to furnish the power now supplied by central electric stations of the country. In 1902 less than 1,500,000 horses would have sufficed.

Local Regulating Ordinances and the Electrical Industry

Hampering Regulation Subject to Political Influences Will Not Tend to Benefit Legitimate Contractor, Dealer, Manufacturer, Central Station or Public—Proposed Ordinance Widely Studied

An ordinance proposed for passage in the City of Chicago, and intended to regulate and tax the various activities of the electrical industry, has been exciting considerable comment and some more direct action since it has been called to attention through the columns of ELECTRICAL REVIEW. The New York State Association of Electrical Contractors and Dealers has taken up a study of such regulation as that proposed, and through their secretary, J. P. Ryan, has expressed doubt as to the likelihood that any good might result from such regulation. Mr. Ryan's comments follow:

"The publication in ELECTRICAL REVIEW, April 9, 1921, of the proposed Chicago city ordinance to regulate the sale, installation and use of electrical devices, together with the editorial comment, should, it seems to me, have a tendency to impress the electrical industry with the importance, not to say the dangers, of this class of legislation to the electrical industry, and the following extract from the minutes of a meeting of the board of managers of the New York State Association of Electrical Contractors and Dealers, held in Albany April 13, 1921, will, it is hoped, have a tendency to concentrate the attention of the industry on conditions with which they seem to be confronted, which should have serious consideration:

" 'The reports submitted by the members present and by the secretary indicated considerable activities in various districts with a view to legislation by the municipalities relative to licensing electrical contractors. The subject in various forms is now under consideration in Binghamton, Buffalo, Rochester, Syracuse, Watertown, Yonkers and New York City. Information available would indicate that no two districts or municipalities are considering similar arrangements, and it is to be feared that if this important subject is handled in this miscellaneous way it will result in a welter of rules and regulations which will be contradictory and obviously embarrassing to contractors in attempting to execute work in different localities which will essentially result in retarding our important and growing industry, and will undoubtedly have a tendency to bring about municipal inspections which will be a duplication of the present inspection system and result in controversies over the interpretation of rulings which will inevitably cause delays and expense to contractors in the execution of their work.

" 'Statistics available indicate that where such laws exist, particularly in New York and Chicago, they have proved a serious detriment and involved an expense to the contractors for which no adequate service has been rendered. The fundamental idea in the minds of contractors on this subject seems to be that the industry is suffering from the amount of work that is being done by others than those legitimately engaged in the contracting business. While this may be true it is a serious question whether or not any license legislation will have any tendency whatever to obviate this condition. Such a law was enacted in New York City during 1914, making the National Electrical Code a city ordinance, creating a license board and licensing contractors. Over 5 yrs. of experience proves conclusively that there is a larger percentage of irresponsible so-called contractors in business in the territory covered by this ordinance than in any other section of the country.

" 'It has been found impossible to set up any standard of qualification other than a technical one, and while it is to be regretted it is a statement of fact that in many cases the irresponsible man who makes a study of the code with a view to circumventing it makes a better showing on an examination than the man who is conducting his business in a reputable way. This examination, however, seems to be the only standard available, and all who qualify technically are necessarily granted licenses and are placed on an equal footing.

" 'This places the responsible contractor who has an organized business at a disadvantage, as the purchasing public logically concludes that licenses, being granted by legal authority and under a given standard, should be certificates of competence in all respects, leaving only the question of the lowest bidder to be considered. The necessary result in many cases is that work is given to those totally incapable of performing it properly and rendering the service to which the purchaser is entitled, resulting in dissatisfaction on the part of the purchaser who logically concludes that there seems to be no reliable standard by which the responsibility of those in the electrical contracting business can be judged.

" 'These ideas, based on experience and statistics, are given with the hope that this matter will receive serious consideration by the district associations and the membership, with a view to formulating some definite policy on this important subject, as, if it is ultimately decided that license legislation would be of interest to the majority of the Association membership, some standard should be adopted to bring about conditions which will be as nearly uniform as possible for the purpose of avoiding political control of our industry.

" 'New York State Association of Electrical Contractors and Dealers,

" 'J. P. Ryan, Secretary.' "

The above comments, it will be noted, pertain to only one phase of the regulations proposed for

Chicago. The part of the Chicago ordinance covering the New York contractors' problem, or the problem of contractors in any district where similar regulations might be instituted, is given below:

BE IT ORDAINED BY THE CITY COUNCIL, CITY OF CHICAGO:

Section 1.—*License required to sell.*—That no person, firm or corporation shall engage in the business of disposing of, selling or offering for sale any fixture, fitting, apparatus, appliance or device of any character whatever intended to be used within the City of Chicago for the generation, transmission or utilization of electrical current for light, heat or power purposes unless such person, firm or corporation shall have obtained a license so to do from the City of Chicago; provided, however, that electricians licensed under the ordinances of the City of Chicago for the installation of wires and apparatus for light, heat and power purposes and disposing of or selling only such fixtures, fittings, apparatus, appliances or devices as are installed by them under the authority of permits issued by the Commissioner of Gas and Electricity shall be exempt from the requirements of this section.

Section 2.—*Approval of materials and devices.*—No person, firm or corporation shall install, use, dispose of, sell or offer for sale any electrical fixture, fitting, apparatus, appliance or device of any character whatever intended to be used within the City of Chicago for the generation, transmission or utilization of electrical current for light, heat or power purposes unless the same shall have been first approved by the Commissioner of Gas and Electricity.

Section 3.—*Licenses—Applications—Fees.*—Any person, firm or corporation desiring to engage in the business of disposing of, selling or offering for sale any electrical device of the type described in *Section* 1 hereof, shall make application so to do to the Commissioner of Gas and Electricity on a form approved by him. Such application shall contain the business name and business address of such person, firm or corporation and such other information as the Commissioner of Gas and Electricity shall require, and shall also contain an agreement made by the applicant to dispose of, sell or offer for sale for use in the City of Chicago only such materials or devices described in *Section* 1 hereof as have been approved by the Commissioner of Gas and Electricity. Upon filling such application in proper form and upon the deposit of the license fee of Fifty dollars ($50.00), the Commissioner of Gas and Electricity shall issue to the applicant a license permitting him to dispose of or sell such materials or devices for a period of one (1) year from the date of the issuance of said license. Said license may be renewed for an annual fee of Fifty dollars ($50.00) and shall not be transferable.

Section 4.—*Licenses—Number required.*—Where a person, firm or corporation shall engage in the business described in *Section* 1 herein, at more than one location or place of business, a separate license shall be obtained for each such location or place of business.

Section 5.—*Revocation of license.*—The Mayor may revoke the license of any licensed electrical dealer for the violation of this or any ordinance of the City of Chicago relating to the disposal or sale of electrical materials or devices of the class mentioned in *Section* 1 of this ordinance, or if in his discretion the holder of such license is incompetent or unfit.

Section 11—*Penalty.*—Any person, firm or corporation who shall violate any of the provisions of this ordinance or who shall install, use, dispose of, sell or offer for sale any electrical fixture, fitting, apparatus, appliance or device of any character whatever intended to be used within the City of Chicago for the generation, transmission or utilization of electrical current for light, heat or power purposes which is not approved by the Commissioner of Gas and Electricity, or who shall engage in the business of disposing of, selling or offering for sale any such materials or devices without having obtained a license so to do, shall be fined not less than Fifty dollars ($50.00) nor more than One Hundred dollars ($100.00) for each offense, and each day's violation hereof shall constitute a separate offense.

Other phases of such regulation as that now proposed in the City of Chicago will be commented upon from time to time in the ELECTRICAL REVIEW.

TEST CHART FOR USE IN BATTERY-CHARGING STATIONS.

Logical Diagrammatic Arrangement of Symptoms Makes It Easy to Locate Quickly Almost Any Type of Battery Trouble.

The chief fault to be found in many automobile-battery service stations is that the men in charge are not able to tell just what a battery may need without tearing it to pieces. This fault, however, is being overcome in a large number of stations by the use of a convenient chart put out by the Allen-Bradley Co., Milwaukee.

The Allen-Bradley battery test chart is a new idea in battery testing and it greatly widens the scope of usefulness of the high-rate discharge test. The chart is printed in color and arranged systematically to show the service man what each indication of the test set and the hydrometer means in terms of battery trouble. Battery troubles are quickly and positively located, and questions asked by the customer find ready answer "on the chart." The accompanying illustration shows the chart.

Report on Fees for Practicing Engineers

Committee of the American Association of Engineers Submits Tentative Draft for Schedule of Remuneration for Service in Private Practice — Blank Proposals and Service Contracts

Practicing engineers will be interested in knowing that the progress report of the committee on services and fees for practicing engineers, which has just been submitted to the board of directors of the American Association of Engineers will appear in pamphlet form. The pamphlet will include the tentative forms of proposal for engineering service and contract for professional services. Copies may be had upon request to American Association of Engineers, 63 East Adams street, Chicago.

The progress report of the committee gives schedules based on hydraulic, sanitary, municipal and structural work, and recommends that similar schedules be prepared covering mechanical, electrical, chemical and other divisions.

The purpose of the committee on services and fees for practicing engineers has been to consider questions of fees and services arising in general engineering practice in the relation of engineer and client. The field covered is that of the so-called practicing engineer, a term intended to include all engineers in private practice.

The conclusion reached after considering many schedules now in existence is that at the present time no fixed or rigid schedule of fees is possible. It is believed, however, that a schedule should be prepared for all the main lines of engineering work. The committee suggests that an investigation be made of the number and kind of practicing engineers in the American Association of Engineers and that schedules to meet their needs be drawn up. A special committee to prepare a compilation of fees for all classes of work and to make a collection of standard proposals and concontracts to aid in the preparation of such a schedule is suggested. It is possible that a separate section for practicing engineer members of the association may be organized.

The schedule of fees which forms a part of the form of proposal drawn up by the committee is based largely upon the experience of the members of the committee in the somewhat restricted fields of hydraulic, sanitary, municipal and structural work. It is but a tentative plan—a basis upon which to build schedules of fees covering the many subdivisions of engineering practice, whether it be mechanical, electrical, chemical, civil or any other division. Fees and services are dependent upon one another; a schedule of fees must be predicated upon a schedule of services to be of any particular value. In the compilation of the accompanying table a very definite service schedule was drawn up, based upon an initial division into two parts:

(A) Special engineering services.
(B) Regular engineering services.

Under special engineering services (A) there are placed:

(1) Consultation, (2) arbitration, (3) professional advice, (4) expert testimony, (5) valuations and appraisals, (6) service and efficiency tests, and (7) reports.

Under regular engineering services (B) there are:

(1) Reconnaissances, surveys of all kinds, borings, soundings, tests, experimental work and a compilation of all data necessary for the preparation of (a) preliminary reports, (b) preliminary estimates of costs and (c) plans and specifications (B-1 of table). However, further investigations will make it practicable to include some of the services, especially surveys, on a percentage basis.

(2) Necessary conferences, preparation of preliminary plans, estimates and reports covering all features of the work with various alternate plans setting forth the advantages and disadvantages, cost of operation and maintenance, and recommendation for a solution of the particular problem. (B-2 of table.)

(3) Preparation and presentation of working plans, profiles, specifications and estimates for letting of contracts or purchase of material and machinery and for complete information of client or owner, describing in detail manner under which contract or contracts will be let, general stipulations, complete detailed description of all parts of the work, general manner in which work shall be done, forms of proposal blanks, contracts and bonds, and detailed estimates of cost. (B-3 of table.)

(4) Attendance and advice at meeting for award of contracts of construction or for purchase of materials and machinery, general supervision of construction work during progress, progress reports, and rendering of estimates. (B-4 of table.)

By "general supervision" is meant occasional visits of a principal to the work, and such office work at headquarters as may be necessary to prepare progress estimates and reports, correspondence between field and office, and final records. It does not include resident engineers, surveys and inspection work in the field or testing.

(5) Resident supervision of construction continuously "on the ground" during the progress of the work to see that the plans, specifications and contract are being followed. (B-5 of table.)

(6) Purchase of all materials, equipment and machinery. (B-6 of table.)

(7) Complete management of project from inception to completion, but not financing. (B-7 of table.)

With the schedule of services established, the schedule of fees follows as a natural sequence. The fees may be generally classified as:

(1) Per diem charge or rate.
(2) Fixed fee.
(3) A percentage of the cost for various stages of the work depending upon the cost of the project.

Charges for all classes of work under "A" of the schedule of services may be placed on a per diem basis and should vary according to the character of the work, its magnitude and importance. The charge should vary from $50 a day upwards. Retainer fees may also be properly charged. Additional charges should also be made for all actual expenses such as traveling and general office expense.

Instead of the per diem charge as set forth in the schedule a fixed total sum may be agreed upon.

For services listed under "B" of the schedule of services, charges may be made on a percentage basis. The percentage should be computed upon the entire cost of the completed work, exclusive of the legal and engineering work, or upon the estimated cost pending execution or completion. The term "cost of work" refers only to such parts of the whole work as the engineer may be engaged to do.

In applying schedule of fees, it should be borne in

PROPOSAL FOR ENGINEERING SERVICES

.....

.....

.....192....

In accordance with all stipulations herein contained, we propose to render to.....

.....professional services for such purposes, to such extent and in accordance with such schedule of fees as are specifically set forth.

The character of the work to be performed is, for convenience of reference, designated as follows:

A. SPECIAL ENGINEERING SERVICE

1. Consultation.
2. Arbitration.
3. Professional Advice.
4. Expert Testimony and Court Work.
5. Valuations and Appraisals.
6. Service and Efficiency Tests.
7. Reports.

B. REGULAR ENGINEERING SERVICE

1. Reconnaissances, surveys of all kinds, borings, soundings, tests, experimental work and compilation of all data necessary for the preparation of (a) preliminary report, (b) preliminary estimates of quantities and cost and (c) plans and specifications. (B-1 of Table.)
2. Necessary conferences, preparation of preliminary plans, estimates and report covering all features of the work with various alternate plans and setting forth advantages and disadvantages, cost of operation and maintenance and recommendations for solution of the particular problem. (B-2 of Table.)
3. Preparation and presentation of working plans, profiles, maps, specifications and estimates for letting of contracts or for purchase of materials and machinery, and for complete information of the client or owner, describing in detail manner under which contracts will be let, general stipulations, complete detailed description of all parts of the work, the general manner in which work shall be done, forms of proposal blanks, contracts, bonds and detailed estimates of cost. (B-3 of Table.)
4. Attendance and advice at meetings of client or owner for award of contracts for construction or for purchase of materials and machinery, supervision of construction work in office during progress, progress reports and rendition of estimates and final records for filing. (B-4 of Table.)

   By "General Supervision" is meant occasional visits of a principal to the work, and such office work at headquarters as may be necessary to prepare progress reports and estimates, correspondence between field and office and final records. It does not include resident engineers, surveys and inspection work in the field or testing.
5. Resident supervision of construction continuously "on the ground" during progress of the work, to see that the plans, specifications and contract are being complied with. (B-5 of Table.)
6. Purchase of all materials, equipment and machinery. (B-6 of Table.)
7. Complete management of project from conception to completion, but not financing. (B-7 of Table.)

According to the method agreed upon, charges for services will be based upon the following:

SCHEDULE I. (a) **PER DIEM CHARGE OR RATE OF** .....

.....Dollars ($.....) covering services.....

.....

.....

.....

and in addition the actual cost of all traveling and hotel expenses for principals and employes. All items of expense shall be evidenced by vouchers and directly chargeable to the work, such as telephone and telegraph bills, blue prints, printing, maintenance of resident organization, pay roll for all employes engaged on the particular work as evidenced by time distribution records, and an item of..... (.....) per cent on the apportioned pay roll to cover indeterminate overhead expenses such as rent, light, postage, stationery, drawing materials and wear and tear on furniture, instruments and other equipment.

(b) A retainer fee of.....Dollars

($.....) will be payable upon the acceptance of this Proposal.

(c) When doing office work eight (8) hours shall be considered to be a day, but when absent from the office each day of 24 hours shall be considered a day regardless of the actual time spent on the work.

(d) Itemized expense accounts for services rendered will be presented monthly in such form that all details can be readily verified by inspection of our records. Inasmuch as this class of service is, except for the per diem charge, based upon cost, settlement of the account shall be made on or before the fifteenth (15th) day of the month during which such statements are presented.

SCHEDULE II. (a) **FIXED FEE** in amount of.....Dollars

($.....) shall include all expenses of every nature and description incident to the services rendered for services

.....

(b) A retainer fee of.....Dollars

($.....), will be payable upon the acceptance of this proposal.

(c) This sum shall be due and payable as follows:.....

.....

.....

.....

SCHEDULE III. (a) **PERCENTAGE OF COST OF WORK.** These fees are based upon the total estimated cost of the entire work predicated on the market value of all materials and equipment incorporated therein and exclusive of the cost of land, all legal expenses and moneys paid to the engineer.

(b) The percentage varies with the magnitude of the work and the scope of the service required as set out in the following table.

TABLE OF MINIMUM PERCENTAGE FEES FOR ENGINEERING SERVICES COMMITTEE ON SERVICES AND FEES OF PRACTICING ENGINEERS AMERICAN ASSOCIATION OF ENGINEERS

SERVICE CLASSIFICATION	ESTIMATED COST OF PROJECT IN DOLLARS										
	$10,000 to $25,000	$25,000 to $50,000	$50,000 to $100,000	$100,000 to $200,000	$200,000 to $300,000	$300,000 to $500,000	$500,000 to $750,000	$750,000 to $1,000,000	$1,000,000 to $1,500,000	$1,500,000 to $2,000,000	$2,000,000 and up
B-1 Surveys	Actual Cost including Overhead plus a Profit of 25% and upwards.										
B-2 Preliminary Reports	2.25	1.75	1.20	.80	.70	.60	.55	.50	.45	.40	.40
B-3 Plans and Specifications	5.00	4.50	3.75	3.25	3.00	2.75	2.65	2.60	2.55	2.50	2.50
B-4 General Supervision	2.00	1.90	1.70	1.50	1.40	1.35	1.35	1.25	1.20	1.15	1.10
Total B2-B3-B4	9.25	8.15	6.65	5.55	5.10	4.70	4.55	4.35	4.20	4.05	4.00
B-5 Resident Supervision	Actual Cost including Overhead plus a Profit of 25% and upwards.										
B-6 Purchasing	2.00	1.80	1.35	1.00	.90	.85	.80	.75	.70	.70	.65
B-7 Management	5.50	5.00	4.30	3.50	3.00	2.75	2.55	2.45	2.35	2.25	2.15
Total B6-B7	7.50	6.80	5.65	4.50	3.90	3.60	3.35	3.20	3.05	2.95	2.80

(c) The fee of.....

per cent for services.....

.....shall be paid as follows:

.....

(d) In addition to the above, the cost of surveys B-1 and charges for resident supervision B-5 will be billed monthly to cover expenses incurred during each preceding month. These accounts will be itemized in such detail that they can be readily verified by inspection of our records.

(e) In the event that it should become necessary or expedient to abandon the project for which our services were required, an adjustment of the fee shall be made on the same basis as that of the partial payments or the application of the per diem rates for all work done previous to notification of abandonment. These rates for application are set forth in Schedule I and the general provisions applicable thereto. Our records are kept in such a manner that such cost may be accurately determined.

(f) When services are required other than those reasonably to be expected for the proper fulfillment of the contract, per diem charges may, if the work involved is of considerable magnitude, be made in addition to the percentage fees provided for.

(g) The following are some of the services falling outside of the scope of "Regular Engineering Service" such as are contemplated under a percentage contract unless the management of the project is included:

Alterations of convenience after the general plans have been approved by the client or owner and after the preparation of the detailed plans is under way. (To be paid for on same basis as B-1 and B-5 of Table.)

Additional work caused by failure of contractors to fulfill their contracts. (To be paid for on same basis as B-1 and B-5 of Table.)

Services required in connection with legal proceedings, franchises, purchases of property, securing rights-of-way, introduction of accounting systems, preparation of forms for the conduct of business, establishment of rates and closing of contracts for power, organization of construction forces or operating personnel. (To be paid for on same basis as B-1 and B-5 of Table.)

APPLICABLE TO ALL SCHEDULES

If problems should arise in the solution of which the services of specialists are required, the cost of such shall be paid for by the client or owner, but the engagement of such specialist shall be subject to the approval of the client or owner as regards selection and compensation.

We will furnish.....(.....) complete sets of plans and specifications for use of.....

it being understood that all prospective bidders will be required to pay a deposit of.....

.....Dollars ($.....) for each complete set so furnished, which amount will be refunded to the bidder upon the return in good condition of all plans and specifications within

.....(.....) days after receipt of bids.

All provisions of this Proposal shall be binding unless specific exceptions thereto are set forth in the contract.

Respectfully submitted,

Address:

.....

mind that engineering services may be contracted for using any one of the foregoing schedules, or any combination of them, depending on circumstances.

The present committee includes Webster L. Benham, of Kansas City, chairman; Louis E. Ayres, Ann Arbor, Mich.; John W. Cunningham, Portland, Ore.; George W. Fuller, New York City; Farley Gansett, Harrisburg, Pa.; Samuel A. Greeley, Chicago; A. N. Johnson, College Park, Md.; Ira W. McConnell, New York City; Langdon Pearse, Chicago; Edgar A. Rossiter, Chicago; Charles V. Seastone, Madison, Wis.; Wilbur J. Watson, Cleveland, O., and F. C. Armstrong, Chicago, secretary of the committee.

In addition to these men, representatives of about 70 chapters and clubs have been appointed by their respective presidents to co-operate with this committee in its work

PROFESSIONAL SERVICE CONTRACT

THIS CONTRACT AND AGREEMENT, made and entered into this.....day of....., 192....., by and between.....

.....

hereinafter designated as the Engineers, party of the first part, and....., hereinafter called the Client, party of the second part.

WITNESSETH: That for and in consideration of the mutual covenants and agreements hereinafter contained, the parties hereto for themselves, their successors and assigns, have mutually agreed and do agree with each other as follows:

ARTICLE I.

It is mutually agreed that the Proposal hereto attached is part and parcel of this Contract and all provisions of this Proposal are binding, except as follows:

.....

.....

.....

.....

.....

It is further agreed that all previous communications and contracts between the parties hereto, with reference to the subject matter of this agreement, are hereby abrogated and that this agreement, duly accepted, constitutes the sole contract between the parties hereto.

ARTICLE II.

It is mutually agreed that the work for which services are to be rendered hereunder will embrace.....

.....

.....

.....

.....

.....

.....

ARTICLE III.

The engineers agree, in connection with the work designated in Article II, to render professional service to the client as follows:

.....

.....

.....

.....

.....

.....

the character of such service, and the extent thereof, being, for the convenience of reference, more particularly designated as Class..... .....in the Proposal

ARTICLE IV.

The client agrees to pay to the Engineers, at times and in the manner set forth, such parts thereof, and the entire fee, and all other charges stipulated in the Proposal and designated as Schedule....., and,

The client further agrees that, in accordance with accounts properly rendered, all payments due hereunder will be made on or before the fifteenth (15th) day of the month during which such statements are presented.

ARTICLE V.

The client agrees that partial payments on the Engineers' fee will be made in accordance with the terms as set out in the Proposal.

ARTICLE VI.

WHEREAS, the total amount of the fee and the proportional parts thereof may be predicated on the estimated cost of the work, which, however, cannot be determined with any degree of accuracy until after a considerable amount of the work has been performed by the Engineers, and,

WHEREAS, certain payments on this account will become due prior to the determination of the estimated total cost of the work.

NOW, THEREFORE, IT IS MUTUALLY AGREED that, for the purpose of computing partial payments on the Engineers' fee prior to the correct determination thereof, and for this purpose only, the total estimated cost of the work will be assumed to be..... .....Dollars ($.....), and

IT IS FURTHER AGREED that certified copies of the estimated cost of the work shall be attached hereto as soon as the work performed by the Engineers will have progressed to the point where this can be established, and that thenceforth the Estimated Cost of the work shall and hereby is determined and fixed to be.....Dollars ($.....), and,

IT IS FURTHER AGREED that adjustments and corrections in the partial payments already made will be effected forthwith and in a manner to conform with the requirements of the Schedule of Fees under which this Contract has been closed.

ARTICLE VII.

The client agrees that all plans and specifications prepared by the Engineers for this work being instruments of service, are and shall be considered to be the personal property of the Engineers, and the right to use the same shall not pass from the Engineers until all payments, made hereunder shall have been fully made in cash.

IN TESTIMONY WHEREOF, the parties hereto have caused this Contract to be executed in duplicate by their duly authorized officers or representatives on the day and year first above written.

.....

By.....
Party of the First Part.

Address:

.....

.....

.....

By.....
Party of the Second Part.

Form 73—Tentative Form of Professional Service Contract. Copyright 1921 by American Association of Engineers

Spreading the Good-Will Gospel for Public Utilities

Organization and Operation of Illinois Committee on Public Utility Information — Educational Material for Schools and Colleges, Libraries, Officials and Members of Legislature

The most comprehensive and intensive effort ever made in this country to cultivate public goodwill for an industry—the campaign of the Illinois Committee on Public Utility Information—is 2 yrs. old this month (April). Merely cursory survey of its history reveals amazing evidence of what can be done in this field by intelligently practical planning, consistently and persistently followed up under the direction of experts.

The purpose of the committee from its inception (to use its own words) has been: "to conduct a systematic campaign for informing the public on the fundamentals and particularly the economics of the public-utility industry, and thereby endeavor to cultivate a public opinion friendlier both to the industry and to the individual electric, gas, street railway and telephone companies. It utilizes all possible agencies for getting the case of the utilities before the public. It relies mainly upon newspapers but it has also developed systematic utilization of other agencies, including public speakers, pamphlet literature and the public schools.

The committee celebrates its second anniversary by passing the 5,000,000-mark in pieces of literature distributed. These 5,000,000 pieces of literature have not been merely scattered broadcast but have been definitely placed—each piece—in somebody's hands; and each piece was specially prepared or selected, and approved by hard-headed practical utility men, to be helpful to the utility industry.

This literature has gone to the general public by republication in newspapers and by other usual channels. Special pieces of it have gone directly into the hands of customers of public utilities, business men (members of chambers of commerce and other associations), bankers, lawyers, employers (for their employes), teachers, preachers, librarians, students in colleges and high schools, mayors, members of city councils and village boards, public officials of all kinds and candidates for public office. Members of the present Illinois legislature, for example, were receiving educational matter on public utility questions as soon as they become candidates and before they were elected or were even nominated in the primaries.

Copyright 1921, Matzene, Chicago.

Bernard J. Mullaney.

Director of Illinois Committee on Public Utility Information; also Manager of Public Relations of Peoples Gas Light & Coke Co., Chicago. His experience in public and business life has embraced 10 yrs. as legislative reporter and political editor on the *Chicago Herald;* 10 yrs. in advertising as advertising manager for Carson Pirie Scott & Co. and Armour & Co., and as head of his own advertising agency; 4 yrs. in public office, first as secretary to Mayor Busse of Chicago and later, when the Department of Public Works (Chicago's most important city department) fell into difficulties, as Commissioner of Public Works. During the war he had charge, as a volunteer, of all public activities of the Illinois State Council of Defense.

But the scope and effects of what the Illinois Committee has done and is doing are by no means confined to Illinois. It has helped organize and start similar educational campaigns in nine other states —Indiana, Kentucky, Ohio, Nebraska, Missouri, Oklahoma, Arkansas, Wisconsin and Michigan—and has inspired the preliminary steps in Iowa, Texas, California, New York, Kansas, Oregon and Georgia. Its newspaper material and all of its literature is available for use in other states for the asking or the taking, and is extensively so used. Its speakers' bulletins, school pamphlets and other publications have been circulated from coast to coast. Its special publications designed for customers, for investors, for employes and for industries allied to or dependent upon the utilities have been made available to all who might be interested, and have thus been circulated all over the United States.

In addition to its directly educational work, the committee has established and standardized itself as an information committee. Its informational help is constantly sought—and from all parts of the country—by newspapers wanting data pertinent to current news, by high school and college students facing a debate or a thesis, by lecturers wanting to freshen up platform material, by writers of circular, publicity and advertising matter for investment houses and so on. Even members and employes of the state public utilities commission draw upon the committee's resources.

Noteworthy is the fact that the committee has not once been seriously accused by newspaper, politician or utility-baiter of trying to "propagandize" the public. This absence of hostility,

as well as much of the committee's success in getting its educational matter accepted and printed, is attributed to its strictness in living up to the "information" part of its name.

The time has not yet come for estimating, in definite terms, the results of the Illinois committee's work. A soundly conceived and well grounded educational program needs more than 2 yrs. in which to prove itself in full. Educating is a slow process at best and the efficacy of any particular campaign is to be fairly judged only by cumulative results over a considerable period. But an indication of what the Illinois committee believes it is accomplishing may be found in the following circumstances:

In the summer of 1920, Chicago and Illinois politicians seized upon the rate increases granted by the public-utilities commission as vote catchers. Violent anti-utility proposals were made in the campaign for the nomination and election of the present state administration. Repeal of the public-utilities law, abolition of the commission and reversion to "home rule" regulation were threatened and were recommended in the governor's inaugural address. Citizens and civic bodies then began to take notice. The Illinois Chamber of Commerce (a federation of chambers of commerce in the leading cities) conducted a referendum on the subject and business men of the state declared for retention of the public utilities law and the commission by a vote of 21,825 to 1039—a ratio of 21 to 1. Talk of abolishing the commission or seriously changing the utilities law has declined.

Another "straw" in the wind: Immediately before, during and immediately after the joint convention of the Illinois electric, gas and electric railway associations, March 15-16, the newspapers of Chicago and Illinois printed a total of 250 columns of matter on the convention and cognate subjects. All of this was the very best kind of "propaganda"; namely, information on the economics and problems of the industry and the phases thereof in which the public (perhaps unconsciously) is directly concerned, presented in terms calculated to inspire friendlier thinking about the utilities.

Some Accomplishments in Spreading Utility Information.

Space limitations forbid anything like a full account of all the Illinois Committee on Public Utility Information has done or how it has operated. The high spots in its routine may be summarized as follows:

A weekly news bulletin goes regularly to the 900 newspapers in the state—about 125 dailies. Special bulletins go to the dailies and press associations when news warrants it. This news service is intended to be informative rather than argumentative; to avoid the political and the controversial; to carry matter that is at once helpful to the utilities and interesting enough to be printed for its own sake.

Use of this matter by the state press averages about 5000 column inches per month, equivalent to considerably more than 250 newspaper columns per month—more than 3000 columns per year. Newspapers that were unfriendly have become friendly; helpful editorials have appeared in the state press literally by hundreds where formerly there were but expressions of destructive criticism or no mention at all.

Speakers bulletins have been issued each devoted to some phase of the utility industry; as for sample, the nature, development and service of public utilities; the prosperity of communities and of public utilities; the history and philosophy of regulation by state commission; utility service rate making, and so on. These furnish any intelligent person ample material for sound talks and as a further guide each bulletin carries one or two sample speeches. The bulletins go to local managers and persons whom they designate, to superintendents and principals of the larger high schools, to many members of financial institutions, to some preachers and to colleges and libraries. Requests for them come from all over the country. A bureau is operated to find engagements, before clubs, civic associations and so on, for dependable speakers on utility subjects. The bureau is also organizing local utility managers, city by city, into local committees to promote discussion of utility subjects in public meetings and otherwise. Local managers have been thus brought together for definite co-operation in nearly 100 communities.

Pertinent addresses and articles by important men, resolutions or other expressions by chambers of commerce and other organizations, exceptional editorials and the like are reprinted and circulated among special classes by hundreds of thousands; also the special publications, already referred to, for customers, investors, employes, etc.

More than 800 Illinois high schools use specially prepared utility industry literature in class rooms, in theme work and in debating societies. This literature is, of course, 100% informative, not one-sided propaganda, and is sent to high school principals and teachers only on request.

All local managers of gas, electric, telephone and traction companies are on the committee's mailing list. By letter, by discussion at association meetings and by reminders from higher executives local managers are constantly asked to co-operate with one another and with the committee in all possible ways, particularly as follows: First, to familiarize themselves with each weekly news bulletin (which they receive one day earlier than editors do), to discuss the contents of the bulletin with the local editor on every opportune occasion and to point out the application of general information in the bulletins to some local situation or question; second, to get utility subjects discussed before clubs and civic organizations by themselves or other dependable speakers, the speakers bulletins aforementioned being always available for speech material; third, to tie in with the committee's work in the schools by getting high school classes to visit utility-company plants, by stimulating debates and essay writing competition, and so on; fourth, to guide the committee in systematic distribution of helpful literature in their respective communities, with a view to getting maximum benefit from it.

Origin of Illinois Plan of Public Utility Information.

Samuel Insull is the "author" of the Illinois Committee on Public Utility Information. He conceived the general scheme and told a group

of "Insull" company executives to "get something started." Thus it was that, with the co-operation of both Bell and independent telephone interests the original membership of the committee in April, 1919, came to be as follows: John F. Gilchrist, chairman, vice-president, Commonwealth Edison Co.; Martin J. Insull, vice-president, Middle West Utilities Co. (now president of the National Electric Light Association); Charles A. Monroe, vice-president, Public Service Co. of Northern Illinois, and Peoples Gas Light & Coke Co. (now president of American Gas Association); Britton I. Budd, president, Chicago Elevated Railways (now vice-president of American Electric Railway Association); Bernard J. Mullaney, manager Public Relations department, Peoples Gas Light & Coke Co.; Clifford Arrick, publicity manager, Chicago (now Illinois Bell) Telephone Co.; W. S. Vivian, secretary-treasurer, United States Independent Telephone Association. Practically every electric,

H. M. Lytle.

Associate director of Illinois Committee on Public Utility Information; studied medicine at the University of Illinois but forsook that to enter the newspaper business. He was identified with Chicago newspapers for 13 yrs. as a reporter, and for a number of years as financial editor and special writer on the *Chicago Record Herald* and *Chicago Tribune* prior to his being engaged to devote his full time to the work of the committee.

gas, electric railway and telephone company in the state is now co-operating and is represented on the enlarged committee through members designated by the state electric, gas, electric railway and telephone associations.

The committee's work was organized and is still guided by Mr. Mullaney as director, and H. M. Lytle, former financial editor of the *Chicago Record Herald,* as associate director. Out of the experience of all concerned in this Illinois campaign have come certain definite conclusions in relation to work of this character, among them the following:

Two important factors in the committee's success have been: (1) the careful way in which its work is done so that no accusation may lie against it of trying to mislead the public; and (2) the motive power supplied by the weekly meetings of the committee and the facilities of the committee members for getting close to local managers and spurring them to co-operative action.

This proximity and local contact are lacking in educational campaigns of national scope when directed from one central point. The Red Cross, the Liberty Loan, the Salvation Army and other war organizations found they could not get publicity results by operating nationally; they had to organize regionally by states and by communities. The Illinois Plan establishes this local contact and, when adopted in every state, it will provide machinery for giving national scope and effect to any kind of utility campaign whether general or special.

Effort to cultivate public good-will for any particular branch of the utility industry—gas, electricity, telephone or traction—gains in effectiveness when it is part of a campaign for the whole industry as under the Illinois Plan. The fundamental problems of all four branches being identical, the axiom that "in union there is strength" aptly applies; the appeal is for a great and all pervading industry instead of for a special interest. At the same time a special appeal for gas or electricity or telephones or traction is in nowise weakened, but gains from the background and support furnished by the broader general appeal.

Really effective cultivation of public good will, as distinguished from superficial scratching of the surface, is a tougher task than it looks to be from the outside. Often it involves problems that are not realized until actually encountered. It is a task for composite intelligence of the highest order; for technical skill and experience in this special field, plus the active assistance—assistance, not merely support—of the industry's ablest men.

WESTERN ELECTRIC DISTRIBUTES BENEFITS TO EMPLOYES.

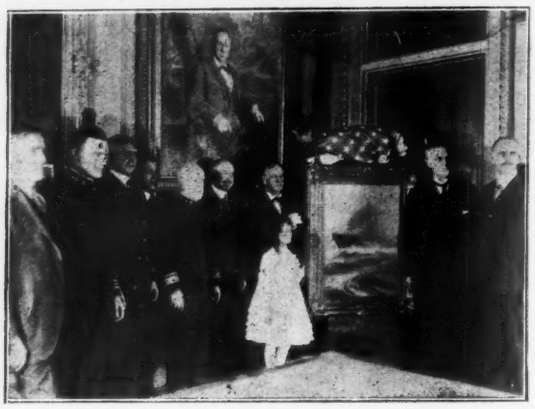
More than $500,000 was distributed last year by the Western Electric Co. to its employes and to other beneficiaries of the Employes' Benefit Fund. During 1920 the Employes' Benefit distributed $548,654 to 6191 beneficiaries, including pensioners who at the end of the year numbered 114. All of these benefits and the expenses of administering the Fund are borne by the company. The diversions of the Western Electric payments show that pensioners received $51,302. Sick employes were awarded $306,143; and the families of workers who died during the 12-mo. period were given $48,792.

The company has been paying pensions to its superannuated employes for the past 15 yrs. In 1913 the Employes' Benefit Fund was established to provide not only for pensions, but also for payments in the case of accident, sickness and death. It is interesting to compare the payments for 1920 given above with the similar payments during the first year the plan was in existence when $34,887 was paid out in pensions, $54,162 for sickness and $15,635 for death.

COMMEMORATING AN ENGINEERING ACHIEVEMENT.

General Electric Co. Presents to Navy Department Oil Painting of First Electrically-Propelled Battleship in the World.

An engineering achievement of the General Electric Co.—the adoption of the electric drive in the U. S. Navy—was recently commemorated when E. W. Rice, Jr., president of the company, presented a handsome oil painting of the U. S. S. *New Mexico*, the first electrically-propelled battleship in the world, to the U. S. Navy Department. In accepting the painting, former Secretary Daniels, during whose 8 yrs. in office the electrification of warships was accomplished, paid a high tribute to the company and particularly to W. L. R. Emmet, a former naval officer and now consulting engineer for the General Electric Co., who developed the electric drive for battleships. Mr. Daniels also briefly reviewed the early discussion on this change, revolutionizing the navy. He said:



Scene at Presentation of Oil Painting of World's First Electrically-Propelled Battleship.

Left to right—Walter L. Greene, G-E artist who painted the picture; Commander Foote; Rear Admiral Dyson; Commander Evans, first to pilot the battleship; Rear Admiral Griffin; E. W. Rice, Jr., president of the General Electric Co.; Former Secretary Daniels; Mary McIntyre, who unveiled the picture; former Assistant Secretary of the Navy Woodbury, and Charles W. Stone, manager of the Lighting Department, General Electric Co.

"It is a privilege to speak for this great department of the government which, you have truly said, has inaugurated many new things that have strengthened our navy and which have blazed the way for a greater merchant marine. I wish to thank you in the name of the navy for this beautiful picture of the *New Mexico*, which is the last word in naval efficiency. I remember very well, shortly after I became Secretary of the Navy, in discussing with Admiral Winterhalter and Admiral Griffin the plans for the construction of our new and greatest ship, the suggestion was under consideration whether the success of the electric drive on the *Jupiter* justified its adoption in the new dreadnaughts. There was much difference of opinion in the navy and outside the navy among engineers of ability as to the wisdom of what was truly a revolutionary departure in the propulsion of battleships. During the discussion I shall never forget spending a whole evening with Bill Emmet —we call him 'Bill' in the navy because he graduated from the naval academy—(I guess you call him by some high title in the General Electric Co.). He is ordinarily a phlegmatic man, quiet and reserved about most matters, but I can never forget his enthusiasm and his wonderful spirit of faith as he discussed it and undertook to convince me that he and Griffin and Dyson and Evans and others in the navy and Winterhalter, were right, and the plan of electric propulsion for battleships should be adopted by the navy. After all, the world is moved by enthusiasm based upon knowledge. It was the enthusiasm of Emmet and our own able engineers that interested me first in the electric drive. I am by nature somewhat of a revolutionist. All the changes in the navy from sailing to the electric drive have come by men who knew that the best is yet to be.

"You may remember, when the decision was made and it was determined to put the electric drive in the *New Mexico* and then determined to put it in all our great ships, there was in and out of the navy strong protest. It came to me by letters and by telegrams and by personal interviews. Not a few predicted that if I approved this method of propulsion I would ruin the navy. My reply was, 'Well, I have ruined the navy so many times one more time will not make any difference.' And so the decision was made; its opponents carried the fight to Congress. A number of engineers went before the Congress to point out that a great battleship run by electric drive was bound to prove an expensive failure and said, 'Let some other nation try it first.' We had a long debate and discussion and the Congress finally decided wisely (I say it with modesty) I think, to let the Secretary of the Navy settle it. The *Jupiter* had just come through the canal. It had weathered the greatest storm in the Atlantic in 20 yrs. and had come through in fine shape. I went to New York and spent a day on it. I liked the looks of it and when I found that the captain and engineers and officers were enthusiastic about it, I came back and found our experts strengthened in the belief it was the modern method of propulsion. I was very glad to have the honor and privilege to sign the order which in the *New Mexico* put America in the lead in electric propulsion, as we were in the flying machine and the submarine and other improvements in ships of the sea and air.

"When abroad 2 yrs. ago I found able naval constructors and engineers who congratulated the American navy in being the first to take this forward step which will eventually be adopted by all countries. It will interest you to know of one of the most distinguished admirals in our navy, a man who was in command of the battleships in the North Sea, an old fashioned sailorman of great ability and brains—none better in the world. In the main he holds to the old ways of seagoing. I refer, of course, to Admiral Hugh Rodman. At first he doubted the wisdom of this new innovation. I spent 10 days on the *New Mexico* last summer with him cruising from Los Angeles up to Seattle, and Admiral Rodman said: 'I want you to come with me all over the flagship particularly to see how the electric drive works. It ought to be adopted throughout the navy. Thirty per cent is saved in money and in cleanliness and in every element that makes an efficient ship. I was opposed to it at first, but I am willing to confess I was wrong, and the engineers and experts in the department and out of the department were right.' That shows he is the kind of big man who will change an opinion when convinced.

"I thank you for the department and for the country for this gift which will adorn the walls of the department, and I thank you for the part, and the large part, the General Electric Co. has played in the improvement—an improvement along the line of other things which your great company has come in progress and development."

"America must move forward," says an editorial in *Collier's Weekly*, "and the speed and comfort with which she moves will depend in a large measure upon her ability to produce, at low costs, heat, power and light. Let each community give some thought to its public utility situation, to the end that we may more quickly give a square deal, not only to the hand that lights the gas stove or turns on the electric switch, but to the investment pocketbook which furnishes the capital as well."

If people are to get more service from public utilities, they must first make it possible for the utility to provide such service.—*Nation's Business.*

EDITORIAL COMMENT

More Light on the Chicago Ordinance

Shall the electrical industry again be subjected to a retarding influence just as it has attained a desirable period of development intended to make electricity a chief economic factor in the domestic, commercial and industrial life of the nation? Not if the splendid co-ordination recently achieved in the industry is concentrated at the point of attack. At present the cloud is only the size of a man's hand but it can very easily become a potential storm and sweep the entire country.

Briefly, this cloud appears in the form of the proposed ordinance—printed in full in the April 9 issue of ELECTRICAL REVIEW—the passage of which by the city council of Chicago will empower the commissioner of gas and electricity in that city to establish an extensive laboratory and to exact that a sample of every electrical device and piece of material used in electrical construction in the city shall first be submitted for test and approval, each sample to be accompanied by a preliminary fee of $5. The ordinance will provide further that these devices and materials shall be submitted annually for re-examination and approval, each unit each time being accompanied by another fee of $5. Where a device or material is rejected the preliminary fee shall not only be forfeited, but an additional charge shall be made based upon the time and expense involved in such examination and test by the examiners in the city bureau.

In order to honestly and thoroughly examine and test all the devices and materials made by manufacturers of products entering into electrical construction and installation a laboratory of immense size, manned by a considerable staff, would be required. That the laboratory and its staff under the jurisdiction of the commissioner of gas and electricity would become a very important cog in the political administration of the city goes without saying. That its effectiveness may be assured, there is a provision in the ordinance to impose an annual license fee of $50 upon every electrical contractor and dealer in the city under which they would be compelled to use and sell only such devices as are approved by the commissioner. A rigid check upon such devices would be maintained by the corps of inspectors from the commissioner's office. For failure to comply with this ordinance as to the use only of city inspected materials, and for other causes at the fancy of the department, the license may be rescinded at the discretion of the mayor. This leaves a loophole for political misuse in the retention of factional support.

The heavy economic upheaval which this ordinance may occasion in the electrical industry will be more clearly understood when one is reminded that not a few manufacturers number several thousand electrical devices among their products. One such manufacturer alone would be required to pay into the Chicago bureau upward of $50,000 annually in fees for a service not to be compared to the broad and efficient scope of the already reliably established and nation-wide service of the Underwriters' Laboratories maintained by the National Board of Fire Underwriters, the U. S. Bureau of Standards and other reliable bureaus. Since there are more than 100,000 inspected and approved devices and materials listed by the Underwriters' Laboratories, not to mention other thousands of devices for which the National Board of Fire Underwriters require no specific approval, it is estimated that electrical manufacturers would be required to pay into the Chicago bureau under this ordinance not less than $500,000 annually. This is a tremendous sum for what, on the face of it, appears to be a duplication and waste of effort, but which is in reality of more far-reaching import with a menace to the entire industry.

If the city of Chicago can successfully tap the electrical industry for even the minimum sum of $500,000 annually, what will be the sum total when the precedent established by Chicago shall have spread to other cities all over the country? And what will the burden mean to the industry—and to the public at large? Chicago already has a more elaborate electrical code than most cities. It is most carefully and comprehensively drawn and is being constantly revised to keep step with progressive developments of the industry and modern demands of the consumer. The great laboratories of the National Board of Fire Underwriters are also located in Chicago and that city is not hampered by distance when it comes to inspection and approval of appliances. The city's facilities are unusually excellent for the protection of the industry and the public without the establishment of a politically operated system such as contemplated by the ordinance whose only excuse appears to be a source of revenue for the city administration.

Since ELECTRICAL REVIEW printed a tentative draft of the proposed ordinance and further called the attention of electrical manufacturers to it by personal correspondence the Chicago Association of Commerce, through its electrical committee, has instituted an investigation for the purpose of combatting it, and various other organizations are taking similar action. The electrical manufacturers are also awakening to the dangers lurking within the ordinance and are seeking means to have their interests presented in a proper light. One of the large manufacturers says:

"We do not feel that the people sponsoring this ordinance fully realize just what it means to the manufacturer. They probably intend the ordinance to protect the city from inferior apparatus, and also derive a revenue from the sale of good apparatus in the city. Unfortunately, in accomplishing the former they will certainly defeat the second purpose because the ordinance makes it prohibitive for a manufacturer to sell his apparatus in Chicago. Irrespective of the expense involved, it would be almost physically impossible for us to submit our complete line of apparatus for approval each year, and certainly the expense entailed in so doing, besides the fee required, would be prohibitive. We feel, therefore, that the passage of such an ordinance would in no way benefit the city, but it would cause a severe hardship and make it very difficult for the city to obtain good and suitable equipment."

The following point made by a manufacturer of lighting fixtures is worthy of consideration by not only the manufacturer, but the dealer who handles fixtures as well.

"The most outstanding objection to the ordinance is that a merchant would necessarily be restricted to dealing only in articles that had been approved. This might be the source of considerable loss, as the merchant might find himself stocked up with a number of articles the manufacturers of which would refuse to pay for the inspection and approval of the goods by the commissioner in charge of the department of gas and electricity."

"The adoption of such an ordinance," says another large manufacturer, "would mean that other cities even down to the smallest, could follow the example of Chicago and adopt similar codes of their own. This would cause higher prices on all goods and conflicting restrictions and designs which would make it necessary to manufacture so many different articles to meet the requirements of different bodies of inspectors that the cost would be enormously increased on all standard goods. On the other hand the jobber and dealer would be obliged to carry so many different designs and kinds of material that the burden would be excessive and work to the disadvantage of the electrical industry as a whole."

Views of the electrical contractor-dealer branch of the industry are fairly well expressed in the article on "Local Regulating Ordinances and the Electrical Industry," embodying the sentiments of the New York State Electrical Contractors and Dealers, which will be found on another page of this issue.

Hazards and Safety

To the average person, electricity is a rather mysterious thing, and there is a general feeling that everything electrical is dangerous. On the other hand, electrical accidents are often the result of disregarding the most elementary natural laws applying to electricity and a failure to appreciate the risk involved. It is a well known fact, the world over, that when the origin of a fire cannot be positively ascertained it is attributed to the electrical wiring, where such is present, or even in many cases where there is no wiring near the premises. Nevertheless, the fact remains that electrical work must be considered as hazardous. It is, therefore, especially important to safeguard every one concerned against injury. This may be in the mine, overhead, on the highway, in the mill, at the factory, in the power house or the home. The importance of this can only be fully appreciated when we recall how little is generally known regarding electricity, that a potential as low as 50 volts may prove fatal, and that moving machinery is essential to generate and often to transform electrical energy. We can see dangerous moving machinery, hear the noise that indicates trouble, feel the heat from hot bodies before we come in contact with them, but we lack an electrical sense to detect the presence of dynamic electricity.

Within the last decade more or less systematic work has been done in the way of minimizing accidents along industrial lines, and some legislation has been enacted in this direction. The liability departments of large insurance companies have compiled statistics of industrial accidents, the classification of which data furnishes a good basis for study of conditions giving rise to all kinds of accidents. A review of these statistics shows that there are comparatively few causes for the majority of accidents, and even fewer general principles, if applied, might materially reduce the hazards. Furthermore, an analysis of such data is valuable in showing what, in the average, does happen, and gives a good basis on which the employer can proceed to make a careful study of his own conditions and take the necessary steps to prevent such accidents being repeated within his own sphere of activity.

Following are a few important rules applying

to the electrical workers; which rules, if observed, will reduce very much the risk of handling circuits of dangerous voltage, or of operating electrical machinery of any kind in any place:

No inspection, repairs or changes of cables, wire or apparatus should be conducted by any one except those authorized.

No temporary work should be permitted unless it is good and safe enough mechanically and electrically to be permanent.

Only skilled and experienced workmen should be employed on hazardous jobs. Such work must be performed under the direction of a competent man at all times.

When instructions are not complete, or not thoroughly understood, consult your superior and follow his directions.

Do not handle circuits promiscuously, and do not get the idea that you are expert at it. Overconfidence breeds carelessness and accidents are the result. Competent men are cautious; only unskilled and inexperienced men take chances.

Avoid working on live circuits except where absolutely necessary; take precautions to insulate yourself thoroughly from the ground and the neighboring wires of opposite polarity, using such means as are provided or as are proper for the risk involved.

Before mounting, examine carefully all poles, brackets, cross arms, etc., to see that they are safe. Do not work on defective poles unless they are properly guyed.

Inspect carefully all guy wires, anchorages, poles, towers and brackets before putting up wire and straining.

Inspect all apparatus and tools used; if same are found defective discard them or have them repaired.

When handling wires of low voltage, such as for telephones and for signals, use the same precautions as in handling other wires with which they may become crossed. It is not safe to depend upon the insulation on the electric wires to protect you against shock. Insulation deteriorates with age and especially when exposed to weather or the action of water in mines.

When working on live circuits remember that you have two hands; don't forget one while the other is at work. Shocks from hand to hand are the most dangerous.

Insulation on tools and rubber gloves are good things if they are suitable for the voltages to be handled, but they are apt to prove a delusion as they cannot be depended upon being in good condition and satisfactory for the purpose, unless continually subjected to critical examination.

Linemen must always use safety belts when working overhead.

Use the same precaution when working on circuits of low voltage as higher voltages, for the reason that they may be crossed with circuits of higher voltages, and it is good training for you when you must work with higher voltages.

Avoid working on circuits running overhead or on lightning arresters while there is any sign of lightning.

Never depend entirely upon tracing out circuits; rather test them out with equipment suitable to the possible conditions.

When working on a dead circuit that might be made alive, treat it as alive.

Where circuits are controlled only from the power house, written instructions should be given to the man in charge of the power to open or close such switches as may be required to control the circuits on which work is to be done. The operator must place a tag on the switch calling attention to danger of closing same before the work is finished. Switch locks, disconnect clips and ground connections should be used in the station. Before the switch is closed see that everything is in the clear and everybody has been notified to keep away from the circuit.

It is the safest plan to short-circuit and ground the circuit that has been made dead before working on it.

Switches and wires of high voltage should be placed out of ordinary reach. Where this cannot be done they must be properly guarded to prevent persons' coming in contact with them.

Apparatus carrying over 250 volts must have its frame or case thoroughly grounded.

All wires must be supported securely on suitable insulators.

Insulated platforms should be installed around apparatus of high voltages that is apt to be touched by the operator or other employes.

Lamps in circuits of 220 volts and higher should not be trimmed without using a suitable insulating platform to stand on.

When working on wires underground, special precautions must be taken on account of the dampness and the fact that grounded circuits are used in such places.

Special rules should be formulated by every organization employing men on live or high-voltage circuits. Such rules should be worked out in minute detail, and should be supplied in convenient printed form to every man liable to have occasion to use or apply them. Then no employe should be authorized to work on live or high-tension circuits until after he has qualified to do so in a practical test and also by demonstrating a complete knowledge of the entire set of rules. This knowledge of the rules should include the ability to quote the rule complete and explain when and how it should be applied in any given case.

THE WEEK'S NEWS

Reports of Important Meetings, Developments and Other Happenings of the Electrical Industry and Its Allied Interests

DETAILS OF CHICAGO CONVENTION OF N. E. L. A.

General Circular Issued by Association Contains Information on Registration, Sessions and Other Features of Convention.

The National Electric Light Association has issued a general convention circular containing details of the 44th convention to be held at the Drake Hotel, Chicago, May 31-June 3, relating to sessions, exhibitions, registration, hotel arrangements, transportation, entertainment, inquiries, etc. The personnel of the General Convention Committee and other committees are also given. The names of the members of these committees were printed on page 622 of the April 16 issue of ELECTRICAL REVIEW.

The Association has provided a complete registration plan for members and their guests and has sent out a card arranged in two sections, covering member and guest registration, which the members are requested to fill out and return promptly to N. E. L. A. headquarters. In filling out these cards members are requested to be guided by the following procedure: Class A, D and F members should fill in the name of whoever will attend the convention as the official representative of the company. Under the constitution there can be but one official voting representative of each class A and D member. As indicated on the guest registration portion of the card, each member of the Association, in whatever class, may register one lady free of charge; for registration of all other ladies a charge of $1 each will be made. The registration charge for each male guest of a class A, B, C, D, E, F or G member (all classes) is $5. There is no registration charge for members of any class.

The convention program promises to be a very comprehensive one, affording discussion of subjects of great importance to the electric light and power industry. The general activities of the Association will be presented for consideration in the general (morning) sessions; the more specialized subjects will be considered in detail at the afternoon sessions of the four National Sections, and the subject of policy will be discussed at an evening session of the Public Policy Committee. Men prominent in public life also will address the convention from the standpoint of the general public, the regulator, and the investor.

The convention will open Tuesday morning, May 31, at 9:30 a. m., and there will be general sessions also on the mornings of the 3 days following, namely, Wednesday, Thursday and Friday, June 1-3. On the afternoon of Tuesday, Wednesday and Thursday there will be held sessions of the four National Sections, namely, Accounting, Commercial, Public Relations and Technical. These afternoon National Section sessions will be run in parallel. The president's reception will be held Tuesday evening, May 31. The Public Policy Committee session will be held Thursday evening, June 2. All sessions will be held at The Drake.

For any special information required in connection with the convention members are requested to communicate with E. W. Lloyd, chairman of the General Convention Committee, Commonwealth Edison Co., 72 West Adams street, Chicago, or the headquarters of the National Electric Light Association, 29 West 39th street, New York City.

INSTITUTE PLANS JOINT MEETING AT SALT LAKE CITY.

Tentative Program Outlined for Annual and Pacific Coast Convention of Electrical Institute to Be Held in June.

The 37th annual convention of the American Institute of Electrical Engineers will be held at Salt Lake City, Utah, June 21-24, jointly with the Pacific Coast convention. From the preliminary arrangements outlined by the Utah Section of the Institute the convention this year should prove particularly interesting and profitable from many viewpoints.

H. T. Plumb has been appointed chairman of the Convention Committee and has appointed 24 subcommittees to handle the various details. Institute headquarters will be located at the Hotel Utah and all technical sessions will be held there.

An outline of the tentative program follows:

Tuesday, June 21.—The convention will open with the annual presidential address by Arthur W. Berresford. A technical session, with the presentation of several papers, under the auspices of the Electrical Machinery Committee will follow. Directly succeeding the technical session a luncheon for the section delegates is scheduled. This will serve as an opportunity for the delegates to become acquainted and to discuss points of general interest. Tuesday afternoon there will be a trip on foot past the most interesting historical Latter Day Saints buildings, followed by a short lecture and organ recital in the Tabernacle. At 7:00 p. m. an auto trip has been arranged to reach the famous Wasatch boulevard at sunset and later to Capitol Hill. A return will be made to the Hotel Utah in time for an informal reception at 9:30 p. m.

Wednesday, June 22.—The second technical session will be held in the morning under the auspices of the Industrial and Domestic Power Committee. For the forenoon a ladies entertainment has also been scheduled with perhaps a luncheon at the Literary Club. On Wednesday afternoon a special train will leave from the Oregon Short Line depot at 1:30 p. m. over the Bingham and Garfield railroad. This trip in addition to magnificent views of Great Sale Lake and Salt Lake Valley will provide an opportunity for Institute members to inspect a typical mining canyon, surface workings of a big mine with mills and smelters. On Wednesday evening it is hoped Prof. Karapetoff will render a piano recital, a feature which will particularly appeal to those members who have heard his recitals at previous conventions.

Thursday, June 23.—The technical session will meet in the morning under the auspices of the Transmission

and Distribution Committee. The Board of Directors will meet at luncheon and follow the luncheon with a short business meeting. Thursday afternoon is assigned to "A Look at Salt Lake City" from the sight-seeing autos or on foot with local members as guides. Arrangements will also be made for those who wish to devote the time to golf or tennis. For the after-dinner entertainment Dr. Broaddus will deliver an illustrated lecture on the wonderful canyons of Utah.

Friday, June 24.—Various miscellaneous technical papers will be presented in the morning. In the afternoon, in addition to the finals of the golf and tennis tournaments, a trip is planned to the Utah Power & Light Co.'s terminal station, the terminus of three 130,000-volt transmission lines, and said to be the largest outdoor substation in the world. Bathing at Saltair Beach is scheduled from 5:00 p. m. to 7:00 p. m., followed either by a dinner in the Ship Café or an old-fashioned basket picnic with dancing for those who wish it.

A. I. E. E. TO MEET IN NEW YORK CITY NEXT MONTH.

The 307th meeting of the American Institute of Electrical Engineers will be held in the Engineering Societies building, New York City, May 20. This is the annual meeting of the Institute, at which the result of the annual elections will be announced and the report of the Board of Directors presented. A technical program will follow the business session. In addition to the regular business of the annual meeting there will be a lecture delivered by Dr. Albert W. Hull, research department of the General Electric Co., on "The Magnetron: A New Electric Valve."

TWO EMINENT SCIENTISTS VISIT RADIO PLANTS.

Relationship Between Electricity and Relativity Discussed by Prof. Albert Einstein and Dr. Charles P. Steinmetz.

On Saturday, April 23, Dr. Charles P. Steinmetz, consulting engineer of the General Electric Co., visited New York City for the purpose of meeting Prof. Albert Einstein of relativity fame, and they spent the day examining units of the Radio Corp. Later, with a party of distinguished research engineers, they went to the control station of the Radio Corp. at 64 Broad street, where Professor Einstein sent greetings to the officer in charge of the Telefunken station at Nauen, Germany. Within 6 min. came the reply: "Greetings to the great scientist." The actual transmission time across and back from Nauen was 0.03 sec., according to Dr. Steinmetz.

"The general theory of electricity is closely related to the general theory of relativity," said Dr. Steinmetz, talking of his discussion with the German professor. "Prof. Einstein is well versed in electrical science, in fact, he is an electrical physicist as well as a chemist and mathematician."

A special demonstration of high-speed transatlantic wireless radio transmission was given at the New Brunswick station for the benefit of Prof. Einstein. He expressed himself as astonished. "Sending messages by cable involves a vast amount of equipment stretching from ocean to ocean," he said. "The radio has the advantage of great speed as exemplified here with a more compact and apparently less expensive equipment."

E. S. Pillsbury, general superintendent of the Radio Corp.; Dr. A. N. Goldsmith of the College of the City of New York and engineers of the Radio Corp., American Telegraph & Telephone Co., Western Electric Co. and General Electric Co. were members of the party.

ELECTRICAL EXPOSITION PROVES GREAT SUCCESS.

Kansas City Electrical Show Demonstrates the Various Uses of Electricity for Domestic and Industrial Purposes.

The first annual electrical show held at Kansas City, Mo., during the week of April 18, surpassed all estimates both in attendance and interest, according to directors of the Electric Club and those in active charge of the exposition. More than 12,000 persons attended the formal opening of the show held in Convention Hall, where various electrical appliances, including the latest inventions in all kinds of electrical equipment and apparatus, were displayed in 115 booths.

The first impression of the visitor on entering the hall was of a vast flood of light from an invisible source. Massive columns with gold designs shining with warm lights within spaced off the booths and presented a scene of striking beauty. From the gallery where many persons, tired after a journey around the hall, went to rest, the show was a carnival display. More than 200,000 cp. of light, cast against a white ceiling, made the hall as bright as day.

On the north side of the hall was hung a picture of the new power plant of the Kansas City Power & Light Co. at the foot of Brooklyn avenue. The company occupied the north end of the arena and gave demonstrations of safety methods used by it.

Every use for electricity was demonstrated in some part of the electrical show. Clothes were washed, dryed and ironed in 15 min. Motion pictures showed the manufacture of many electrical products. During the showing of the pictures music was conveyed by wireless to the audience from a 50-piece band, which played in another portion of the hall.

Domestic science classes of the city schools and of the Kansas City, Kas., high school demonstrated to what extent household duties may be performed by electricity. In another booth work was done on electric machines by students of the Lathrop Trade School.

DISCUSS FREQUENCY PROBLEM AT PITTSBURGH MEETING.

Papers on "The Colfax Power Station of the Duquesne Light Co.," by D. L. Galusha and C. W. E. Clarke, of Dwight P. Robinson & Co.; "The Frequency Problem in the Steel Industry," by B. G. Lamme, chief engineer of the Westinghouse Electric & Manufacturing Co., and "The Interconnection of Steel Plants and Central Stations and Their Relation to the Frequency Problem," by D. M. Petty, Bethlehem Steel Co., featured the technical sessions of the joint meeting of the Pittsburgh Section of the American Institute of Electrical Engineers and the Association of Iron and Steel Electrical Engineers, held in Pittsburgh April 16.

In the morning there was an excursion to the Colfax plant of the Duquesne Light Co. in

which 900 participated. A special train furnished through the courtesy of the Duquesne Light Co. took the visitors direct to the plant. After visiting the plant a buffet lunch was furnished by the Duquesne Light Co. An informal dinner was held in the ballroom of the William Penn Hotel at 6:00 p. m. Short speeches were given by A. W. Berresford, president of the A. I. E. E.; E. S. Jefferies, president of the A. I. & S. E. E., and Arthur Thompson, president of the Philadelphia Co.

TERMS OF UTILITY BILL PLANNED FOR ILLINOIS.

According to reports from Springfield, Ill., the following are the main propositions of the public utilities bill which it is expected will be reported out this week by the committee having the bill in charge:

One, is the repeal in its entirety of the present state public utilities commission and the act. A new commission, one of seven members, to be known as "the Illinois commerce commission," and eight assistant commissioners, will be appointed.

The second is a provision, protecting contracts from impairment, holding that no contract between a municipality and a public-utility company can be set aside or abrogated except by a majority vote of the people.

The third carries the home rule promise made by Gov. Small in his campaign. It provides that a municipality may by ordinance prescribe that control of all intracity utilities shall rest with the municipality, and that such ordinance, once adopted, takes away all control of such utilities from the state commission. The council may submit the question of assuming home rule to referendum vote or a vote may be demanded by a 5% petition. Abandonment of home rule by a city must come through similar action.

All public utilities which are not within a municipality and all public utilities within municipalities that do not adopt home rule are placed under the jurisdiction of the state commission.

The governor appoints the seven commissioners and the eight assistants, the avowed purpose being to permit hearings on contested matters to be had in the cities interested. Appeals lie to the Circuit Court in the circuit where the matter arises.

OFFICERS ELECTED FOR NEW YORK SECTION, A. I. E. E.

Joint Meeting of Electrical and Mechanical Engineers Featured by Discussions on the General Subjects of Engineering Education.

The recent election held by the New York Section of the American Institute of Electrical Engineers resulted, according to announcement made at the joint meeting with the American Society of Mechanical Engineers, in the following officers for 1921-1922: Farley Osgood, vice-president and general manager of the Public Service Electric Co., Newark, N. J., chairman; Harlan A. Pratt, sales manager of the Atlantic Elevator Co., New York City. Managers: Henry C. Carpenter, New York Telephone Co., 104 Broad street, New York City; Harry A. Currie, New York Central Railroad Co., New York City, and H. W. Buck, Viele, Blackwell & Buck, 49 Wall street, New York City, junior past-chairman.

Since the meeting had been designated as Engineering Education Night, the subject of "The Theoretical Engineer: What Is He? Is There a Place for Him? How Should He Be Trained?" was discussed, with Comfort A. Adams, chairman of the Engineering Division of the National Research Council, acting as presiding officer.

Prof. Walter Rautenstrauch, vice-president of the J. G. White Management Corp., presented the qualifications and training of a theoretical engineer from the viewpoint of a corporation, while Dean Frederic L. Bishop, University of Pittsburgh, followed with a detailed description of the training given the students, supplemented with an opportunity of gaining practical experience in industrial plants during the summer vacation. C. R. Dooley, manager of personnel and training, Standard Oil Co. of New Jersey, told how this large successful enterprising corporation developed excellent research and theoretical engineers by a specialized intensive training in the laboratory. The general discussion which followed was participated in by Howard B. Shaw, Henry L. Doherty Co.; Capt. O. S. Beyer, U. S. Army; Farley Osgood, Public Service Electric Co.; Prof. W. I. Slichter, Columbia University, and Prof. Harold Pender, University of Pennsylvania.

EFFICIENCY, THEME OF N. Y. E. S. MEETING.

Mak'ng Engineering More Efficient and Training Men for Efficiency, Among Subjects Discussed by New York Electrical Society.

Efficiency was the topic of the evening when Harrington Emerson, pioneer efficiency engineer, gave an address on "Making Engineering More Efficient" at the 391st meeting of the New York Electrical Society, held at the Engineering Societies building, New York City, April 21. He pointed out the benefits resulting from efficiency and how where there are no standards in certain engineering matters, the tendency is to fall back upon unreliability. The master key in knowledge guides rightly and the qualities of leadership are: Character; competence; courage, and charm; while the seven great moralities are: Adjust the universe to yourself; adjust yourself to the universe; necessity of hygiene; joy of life; practice of the Golden Rule; education and development.

Mr. Emerson, who has been associated for 45 yrs. in railroad work and for the last 25 yrs. as counsellor, also spoke on the present railroad situation. He said that the railroads were originally built and developed on the basis that 40% of their revenue was to be used for maintenance and safety of investment and 60% for materials and personnel service. The former portion consists of taxes, insurance, rentals, uncollectable revenues, depreciation, deferred maintenance, obsoletism, unpaid betterments, government exactions, interest and dividends and must amount to at least 15% on the investment. Today as high as 94% is spent on materials and personnel. Of the three elements entering into every manufactory and business,—equipment,

materials and personnel—the cost of the last factor should not be more than double that for materials for efficient and safe operation. In conclusion the speaker stated that in his opinion the reversion of the operation of the railroads to government ownership would be a great national misfortune and result in a direct tax on the people.

William Maxwell, vice-president of Thomas A. Edison Co., Inc., in telling "How We Test and Train Our Men For Efficiency," said that the application blank requires a full description of the applicant's experience since graduation from school and was designed to test out the four basic mental qualities of concentration, thoroughness, faculty of analysis and logic of mental processes as well as numerous subordinate mental qualifications. Over 5% made statements that upon investigation could readily be proved erroneous. The company endeavors to teach its employes to consider themselves impersonally and become conscious of limitations without breaking the spirit.

Before adjournment a 3-reel moving picture of "The Ignition System of the Typical Automobile" prepared as part of an educational film for the Motor Transport Division of the U. S. Army under the direction of J. F. Leventhal, Bray studios, was shown.

ENGINEERS WILL DISCUSS RADIO TOLL LINE.

A paper on "The Los Angeles-Avalon Radio Toll Line," by Lewis M. Clement, F. M. Ryan and D. K. Martin, will be the feature of the meeting of the Institute of Radio Engineers, College of the City of New York, in the Engineering Societies building, 29 West 39th street, New York City, May 4. The speakers will give a description of a commercial radiophone circuit in daily use and employed as a portion and extension of the wire telephone network of the country.

INSPECTION TRIPS ARRANGED FOR A. S. M. E. MEETING.

Industrial Chicago has many things to show the mechanical engineer and is going to throw them open to inspection by those attending the spring meeting of the American Society of Mechanical Engineers, May 23-26. The places which offer to entertain guests in this way are too numerous to be seen by all within the 4 days of the meeting, so several are scheduled for each day, so arranged as far as possible, that the individual may suit his taste by selection daily without feeling that he is missing something he would like to see.

Tuesday: International Harvester Co., McCormick and Deering plants; Sears, Roebuck & Co., wall paper manufacture, handling and shipping merchandise; Mandel Brothers, package handling, coal and ash handling, connection to sub-street tunnel system; Western Electric Co., manufacture of telephone apparatus and cable for the Bell Telephone system.

Wednesday: Illinois Steel Co., South Works, South Chicago, plate mill, rail mill, Bessemer converters and general steel mill equipment; Commonwealth Edison Co., modern turbine central station at Fisk street; Pennsylvania Lines terminal, freight handling plant, in connection with which there may be visited the neighboring warehouse of Marshall Field & Co. and the U. S. Terminal building; Crane Co., manufacture of valves and fittings in cast iron, malleable iron, steel and brass, the fabrication of pipe work.

Thursday: Chicago Mill & Lumber Co., 120-in. paper machine, manufacture of fibre, corrugated board and paper boxes; Clemetsen Co., manufacture of veneers and "Clemco" office desks; Pullman Co., Pullman cars, passenger coaches and freight cars; Underwriters Laboratories, testing of appliances and devices for fire prevention; Yellow Cab Manufacturing Co., where the ubiquitous cabs come from.

Friday: Milwaukee Railway & Light Co.'s Lakeside plant, trip by rail to Milwaukee, boilers fired with powdered coal; Jos. T. Ryerson & Sons Co., warehouse of about 1,000,000 sq. ft. devoted to machinery and steel products.

A. I. E. E. TO AWARD PRIZES FOR ORIGINAL PAPERS.

Committee on Co-ordination to Formulate Necessary Details of Procedure in Making Awards—Text of Resolutions Adopted.

At various times the desirability of establishing prizes to be awarded by the American Institute of Electrical Engineers to authors of papers has been discussed. The subject has again been active recently, and at a meeting of the Committee on Co-ordination of Institute Activities the following resolutions were adopted and approved at the January meeting of the Board of Directors and referred back to the Co-ordination Committee for the formulation of the necessary details of procedure in making the awards:

Resolved, that it is the sense of the Committee on Co-ordination of Institute Activities that it is desirable for the Institute to award prizes annually to the authors of papers within the field of electrical engineering and of the allied arts and sciences; and we recommend that if this policy be approved by the Board of Directors, the Institute looks forward to establishing eventually, say, three prizes in the following classifications: (1) papers prepared by enrolled students of the Institute and which may have been presented at any meeting of the Institute, a section, or a branch; (2) papers prepared by a member of the Institute who has never before presented a paper before the Institute or any of its sections, and which have been presented at a meeting of a local section; (3) papers prepared by any member of the Institute and presented before any meeting of the Institute, a section, or a branch.

Resolved, that this committee recommends to the Board of Directors that a prize of $100 cash and a suitable certificate be awarded each year to the author of the paper which is designated by a duly authorized committee of award as the most worthy original paper presented during the year at a meeting of any section of the Institute by a member of the Institute who has never before presented a paper before the Institute or any of its sections.

Thus it will be seen that all papers presented at meetings of sections of the Institute during the year 1921 by any member of the Institute who has never before presented a paper before the Institute or any of its sections are eligible for this competition, which is intended to cover the second classification referred to in the first resolution quoted above.

The Co-ordination Committee also considered a specific offer from the Jeffery-Dewitt Co. to donate to the Institute $100 each year for the purpose of establishing a prize for the best paper on a subject within the field of high-tension transmission and distribution. The Committee recommended that "the offer of the Jeffery-Dewitt Insulator Co. be accepted as applying to an award for the calendar year 1921." The board approved this recommendation and referred the matter back to the Co-ordination Committee for

the purpose of formulating the necessary plan of procedure.

The details for making the award have not yet been announced, but it may be understood that all papers presented before the Institute during the calendar year 1921 within the field of high-tension transmission and distribution are eligible for this award. The procedure to be followed in connection with the award of these prizes will be announced later.

ELECTRIC SIGN EXHIBIT TO SHOW MANY NEW DEVICES.

Plans have been completed for the Electric Sign Show which is to be held in the Edison showrooms, Irving place and 15th street, New York City, during the week of May 2-9. Practically every manufacturer has accepted the New York Edison Co.'s invitation to exhibit and an unusually interesting display is assured. Several large flasher signs will be in actual operation and many types of smaller signs will be set up. The operation of the flashing signs will prove valuable from a sales standpoint for there have been a number of improvements in flasher devices, and this exhibit will afford a good opportunity for demonstrating them. The publicity plans for the exhibit call for newspaper displays, posters, follow-up material and special invitations for the manufacturers to send to their prospects.

EXHIBITORS AT ELECTRIC SIGN SHOW.

City Electric Sign Co., New York City.
E. G. Clarke, New York City.
Federal Sign System, New York City.
Frederick Fricker, New York City.
I. P. Frink, New York City.
Norden Electric Sign Co., New York City.
Strauss & Co., New York City.
L. L. Strauss, New York City.
Viking Sign Co., New York City.
B. J. Aplin, New York City.
Betts & Betts Corp., New York City.
W. F. Irish, New York City.
Animated Picture Product Co., New York City.
R. & H. Strachan, Brooklyn, N. Y.
Nedelman & Schoenfeld, New York City.
A. & J. M. Anderson Manufacturing Co., New York City.
Smith-Hecht Co., Indianapolis, Ind.
Sig-No-Graph Co., Chicago.
Mercury Time Switch Co., Detroit.
Displays Co., New York City.
Animated Advertising Co., New York City.
Union Sign Shop, New York City.
Hartford Time Switch Co, New York City.
Kenner & Ross, New York City.
Manufacturers' Distributing Co., New York City.
Commercial Utilities Manufacturing Co., Chicago.
American Sign Co., New York City.
Charles Beseler, New York City.
Automatic Illuminated Advertising Co., New York City.
W. A. Anderson & Co., New York City.
Bulletin Machine Co., Buffalo, N. Y.
T. L. Robinson & Co., Chicago.
The Golden Glow Sign, New York City.
Electro-Graph Co., New York City.
Weiss & Pfluger, New York City.
Eagle Sign Co., New York City.
Rialto Electric Co., New York City.

VENTILATING EQUIPMENT WILL BE EXHIBITED.

During the week of June 20, the New York Edison Co. will display in its showrooms at Irving place and 15th street, New York City, electrically operated ventilating equipment, including air conditioners, humidifiers, temperature-control apparatus and various types of fans for home, office and factory use. Industrial managers are now giving careful study to ventilation and temperature control, since they have an important bearing on production and probably during the week of the exhibit a conference of industrial and ventilating engineers will be held.

COMING CONVENTIONS.

Arkansas Public Utilities Association. Annual convention, Hot Springs, Ark., May 11-12. Chairman of the convention committee, S. E. Dillon, Hot Springs, Ark.

Southwestern Geographic Division of the National Electric Light Association. Annual convention, Hot Springs, Ark., May 13-14. Secretary, H. A. Lane, Oklahoma City, Okla.

American Washing Machine Manufacturers' Association. Meeting at Sherman Hotel, Chicago, May 18-19. Secretary, Enoch B. Seitz, Otis building, Chicago.

Southwestern Electrical and Gas Association. Annual convention, Galveston, Tex., May 18-21. Headquarters, Hotel Galvez. Secretary, H. S. Cooper, 403 Slaughter building, Dallas, Tex.

National Electrical Credit Association. Annual meeting, Richmond, Va., May 19-20. Headquarters, Hotel Jefferson. Secretary, Frederic P. Vose, Marquette building, Chicago.

American Institute of Electrical Engineers. Annual meeting, Engineering Societies building, New York City, May 20. Secretary, F. L. Hutchinson, 33 West 39th street, New York City.

American Society of Mechanical Engineers. Spring meeting, Chicago, May 23-26. Headquarters, Congress Hotel. Assistant secretary, C. E. Davies, 29 West 39th street, New York City.

International Railway Fuel Association. Annual convention, Chicago, May 24-26. Headquarters, Hotel Sherman. Secretary, J. G. Crawford, 702 East 51st street, Chicago.

Stoker Manufacturers Association. Annual meeting, Stockbridge, Mass., May 24-26. Headquarters, Red Lion Inn. Chairman of Publicity Committee, R. C. Beadle, 11 Broadway, New York City.

Electrical Supply Jobbers' Association. Thirteenth annual meeting, Hot Springs, Va., May 25-27. Headquarters, The Homestead. General secretary, Franklin Overbagh, 411 South Clinton street, Chicago.

Pacific Coast Geographic Division of the National Electric Light Association. Annual convention, Del Monte, Cal., May 25-27. Headquarters, Hotel Del Monte. Secretary, L. H. Newbert, 445 Sutter street, San Francisco.

National Electrical Light Association. Annual convention, Chicago, May 31-June 3. Headquarters, Drake Hotel. Executive manager, M. H. Aylesworth, 29 West 39th street, New York City.

New York State Association, National Association of Stationary Engineers. Annual convention, New York City, June 9-11. Headquarters, Hotel McAlpin, 34th street and Broadway. Secretary, E. Davies, 1379 St. Johns place, Brooklyn, N. Y.

National Fire Protection Association. Annual convention, San Francisco, June 14-16. Secretary, Franklin H. Wentworth, 87 Milk street, Boston.

Tri-State Water and Light Association. Annual convention, Asheville, N. C., June 15-16. Secretary, W. F. Steiglitz, Columbia, S. C.

Canadian Electrical Association. Annual convention, Quebec City, June 15-17. Secretary, Eugene Vinet, Power building, Montreal, Que.

American Society for Testing Materials. Annual convention, Asbury Park, N. J., June 20-24. Headquarters, New Monterey Hotel. Secretary, C. L. Warwick, 1315 Spruce street, Philadelphia.

American Institute of Electrical Engineers. Annual convention jointly with the Pacific Coast convention, Salt Lake City, Utah, June 20-25. Secretary, F. L. Hutchinson, 33 West 39th street, New York City.

North Central Geographic Division of the National Electric Light Association. Next convention, Duluth, Minn., June 21-23. Headquarters, Spaulding Hotel. Secretary, H. E. Young, 15 South Fifth street, Minneapolis, Minn.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 12-15. Headquarters, Breaker's Hotel. Secretary, D. L. Gaskill, Greenville, O.

ELECTRICAL COMMUNICATION

Items of Interest in Connection with Present Practice and Progress in the Science and Art of Transmission of Intelligence by Electrical Means

CABLE LINE TO CUBA OPENED BY PRESIDENT HARDING.

Brief Comments on Ceremony of Initiation of Service and Some Features of the Line and Its Construction.

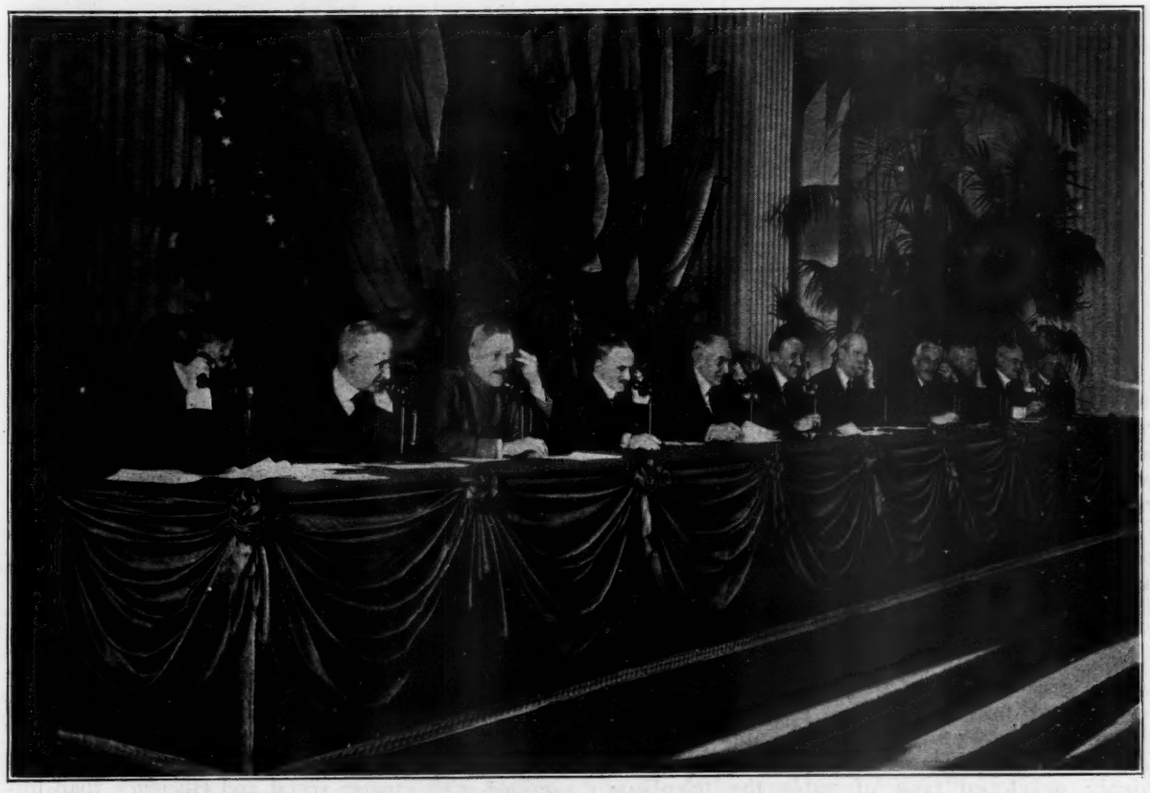
By T. T. Cook.

"Greetings to you, President Menocal!" With a smile of genuine interest President Harding spoke these words in Washington, Monday, April 11, 1921, and formally opened the new telephone cable lines connecting the United States with the island of Cuba. His act demonstrated that it is now possible for subscribers in the large cities of this country to talk direct with Havana, and marked an important advance in submarine communication carried out by the experts of the Bel telephone system.

The ceremony, staged under the auspices of the National Press Club, took place in the stately Hall of the Americas in the Pan American Union building. In addition to the President, the Cabinet, the diplomatic corps and as distinguished an audience as Washington has seen in many a day were in attendance. Receivers were provided for all of the guests, and a thousand or more heard with perfect ease the greetings spoken by the two Presidents. In Havana a similar party was held, and President Menocal headed a brilliant gathering.

Continuing his greetings to the chief executive of Cuba, President Harding said: "I want you, President Menocal, and the government and people of Cuba to know how gratifying it is to participate with you in this ceremony which signifies so much in the establishment of more intimate and understanding relations between Cuba and the United States."

Probably the most dramatic incident of the occasion was the demonstration staged in honor of President Harding by J. J. Carty, vice-president of the American Telephone and Telegraph Co., when he called the roll of telephone men stationed at intervals of 250 mi. along the line



Speakers' Platform at Washington, D. C., End of Line During Ceremony of Opening the Key West-Havana Telephone Cable.

The distinguished gentlemen shown in the picture as participating in and listening to the long-distance conversation are, from left to right: Col. J. J. Carty, vice-president, American Telephone & Telegraph Co., in general charge of the exercises; Assistant Secretary of War Wainwright; General John J. Pershing; Si. de Cespedes, Cuban Minister; President Warren G. Harding; Dr. Rowe, director general of the Pan-American Union; Secretary of State Hughes; Secretary of the Treasury Mellon; Under Secretary of State Fletcher; Commissioner Rudolph of the District of Columbia, and Avery C. Marks, president of the National Press Club.

from Havana northward and across the continent to San Francisco, thence down the coast and to the wireless station at Santa Catalina Island. After receiving a response from the island in the Pacific, Mr. Carty invited the operator in charge of Catalina to talk—by wireless, land lines and the new submarine cable—to the telephone representative in Havana. With the audiences listening intently in the capitals of both republics Havana's voice came clearly over the line saying: "Hello, Catalina! Say just where is Catalina?"

"The total distance between the extreme points of this line," anounced Mr. Carty, "is 5600 mi. This is by far the longest distance over which practical conversation has ever been held." The conversation between these points was the equivalent of a talk from London to Pekin and many miles further. Or it meant that a line of equal length would reach all the way from London to Calcutta and thus unite England with one of the most distant of her colonial possessions.

Completion of the circuits for the establishment of this service required the laying of a cable under about 115 mi. of sea. The water averages about 3000 ft. in depth and in some stretches is over a mile deep. Across this gap sweeps that famous ocean current, the Gulf Stream. Telephone cables had never before been laid over such a distance in water of such a depth. The problems involved were turned over to the experts of the Bell system, and after extensive development and research three separate cables have been laid and are now working between Key West and Havana. Each cable is approximately 115 mi. long and consists of a single copper conductor insulated with gutta percha. The cables are laid several miles apart, except at the extreme ends, so that if one should be broken the others may continue in service. As an additional precaution against serious interruption a total of about 40 mi. of spare cable has been stored under water in a large concrete tank so as to prevent deterioration. The total weight of the three cables is approximately 1750 tons.

Each of the cables carries not only a telephone conversation, but, at the same time, two telegraph circuits in each direction. In order to help the transmission of the telephone currents each conductor is wrapped with a spiral of fine iron wire. Outside the gutta percha the cable is wrapped with copper tape, which serves as a return conductor and also to protect the cable from the teredo or any other destructive form of sea life. Surrounding this are jute wrappings and steel wires providing the required protection from mechanical injuries.

To obtain the necessary electrical efficiency, it has been necessary in the design of the cables to use greater weights of copper than is necessary in land telephone cables. Over one-tenth of the total weight of the cables, or approximately 200 tons, is made up of copper. Even with this highly developed type of cable the telephone energy received at the terminating end is less than 1% of the energy delivered to the cable at the sending end. By means of special apparatus installed at the terminals, however, the energies of the telephone waves are amplified about 75 times, and satisfactory commercial service can thus be given. These telephone amplifiers, with the terminal telegraph apparatus giving the high- and low-frequency telegraph circuits, and the devices for permitting the telephone and telegraph to operate simultaneously, all differ radically from past practice and have required exhaustive development work. The pressure on the submarine cable where it lies at the maximum depth is approximately a ton to the square inch.

The laying of the cables, the installation of associated equipment and the necessary tests required several months. The great weight of the cables and the depth of the water in which they were laid made it necessary to employ a large ship for the major part of the operations. At times while doing the work the ship carried suspended in the water more than a mile of cable. So that the cables might be laid over previously chosen routes, it was also necessary that the steamer have sufficient power to hold a true course even with this amount of cable hanging suspended in the water and subject to the pressure of ocean currents.

AUTOMATIC TELEPHONE INSTALLED IN LARGE BANK.

Complete System Serves All Offices and Departments With Special Provisions for Connection With Central Office Systems.

The Union Trust Co. of Cleveland, recognized as one of the leading banking institutions between Chicago and New York, has just installed what is said to be the largest private automatic telephone equipment in the world. Every department and office of the main office of the company, which occupies the greater part of the 13-story Citizens Building, is given almost instant communication with the other departments by the new automatic system. The equipment used is that of the Keith Automatic Electric Switchboard Co., of Chicago.

The system is equipped to take care of 400 telephone stations in the company's main office, while more can be added as conditions warrant. More than 100 mi. of wire was used in the switchboard alone, while this amount was greatly increased for the connections of the various stations. The system is said to be the last word in intercommunicating telephone systems.

It was necessary to construct a special telephone room on the roof of the building to house the new equipment. Installation of the new equipment was in charge of an expert of the Ohio State Telephone Co., and was completed in record-breaking time, work having been started March 1 and finished by about the middle of April. Each of the 400 telephone stations is equipped with a number dial; the person calling dials the number of the department he wishes to speak with and the automatic equipment puts through the connection and automatically rings every few seconds until the person called answers.

The Union Trust Co. says the numbers are obtained with greater speed and efficiency than under the old manual system. The interoffice stations, of course, can be connected with the outside or main lines, and a force of competent operators in charge of a chief operator will have charge of the old switchboards for both the lines of the Ohio State Telephone Co. and the Ohio Bell Telephone Co.

APPLIANCES and DEVELOPMENTS

New, Improved or Interesting Electrical and Mechanical Apparatus and Devices, and Applications of Equipment and Methods in Practice

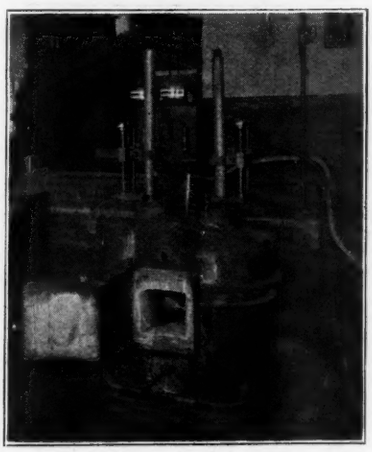
Dining Room Lighting Fixture.

The "Tabelier," the dining room lighting fixture recently brought out by the Morreau Company, 1303 Oregon avenue, Cleveland, Ohio, combines a central light of inverted dome effect surrounded by four candle lights. The design is to give direct light on the dining table, supplemented by additional light from the candlesticks.

A feature of the fixture is that the bottom with the glass disk is hinged. This disk can also be had in color glass as well as the globe on top of the disk.

Muffled-Arc Electric Furnace for Metal Melting.

Tests on two new types of electric furnaces developed by the General Electric Co., Schenectady, N. Y., for melting nonferrous metal, show a percentage of metal loss for yellow brass of less than 1.5% and less than 0.75% for red brass. The thermal efficiency



50-lb. Single-Phase Furnace for Non-Ferrous Metals.

is high, and the expense for refractories and electrodes is reduced to a low value.

These furnaces have been designed in two sizes, a 1500-lb. unit and a 50-lb. unit. Either will melt practically any metal requiring a pouring temperature not exceeding 1500 deg. C. (2372 deg. F.). The 1500-lb. unit is particularly adapted for use in the larger nonferrous melting foundries, whereas the smaller unit should find a large field in small jobbing foundries, manufacturing plants, laboratories and in similar classes of work.

Both furnaces work on the muffled-arc principle, the main difference in construction and design being due to the variation in size and the fact that the 1500-lb. type is 3-phase and the 50-lb. is single-phase. The power-factor for both is 95% or better.

The 1500-lb. furnace melts yellow brass, pouring at 1100 deg. C., with a power consumption not exceeding 270 kw-hrs. per ton, operating 24 hrs. a day with one heat every hour. This gives a total capacity for the furnace of 18 tons of metal in a 24-hr. day. The 50-lb. furnace melts yellow brass, pouring at 1100 deg. C. at the rate of from 100 to 125 lbs. per hr., with a power consumption of from 35 to 40 kw-hrs. per 100 lbs. of metal, providing the furnace is up to temperature at the beginning of the run. The 1500-lb. furnace forms a balanced, steady load on a polyphase circuit, and is equipped with electrode regulators which automatically maintain the desired power input. It has a shell built of steel plate lined with standard fire-clay shapes with a bulged boiler-head bottom. The roof frame is hinged to a bar on the shell at the front of the furnace, the same bar carrying a 3-legged cast-iron spider which mounts the electrode supporting mechanism. This permits the whole top of the furnace to be lifted for inspection or repair of the lining without disturbing the electrodes.

Space in the muffle between the electrode and wearing block, and the side of the muffle, is filled with crushed graphite to muffle the arc. The triangular space where the cross electrodes meet in the middle is filled with a mixture of graphite and tar to insure a good electrical connection. The 50-lb. furnace is constructed on much the same principle, except that in this case the hearth is flat, being designed to receive standard graphite crucibles. There is also some difference in the electrode and block arrangement, since the furnace is for single-phase operation. A horizontal carbon block embedded in crushed graphite extends across the bottom, carrying a wearing block on each end. Between these wearing blocks are four carborundum bricks which form the hearth. Two graphite electrodes extend through the roof to the wearing blocks, the arcs being smothered in the graphite surrounding the blocks. The electrode regulation is entirely manual and is accomplished by adjusting the wheels on the electrode holders. In operation the crucible containing the metal to be melted is set on the carborundum bricks forming the hearth.

Treating of the metal is accomplished by the same action in both furnaces. The current flows from the vertical electrodes through arcs to the crushed graphite and the wearing blocks. These arcs are smothered by the graphite in the muffles, the whole mass becomes heated and forming a heat source of large area and uniform temperature. Heat is radiated to the metal from all directions as well as being absorbed from the muffles and the hearth. The result is a highly uniform temperature distribution free from hot spots. The atmosphere of the furnace is free from oxidizing gases or other agencies which would contaminate the metal.

Two principal disadvantages of the fuel-fired furnace, which are eliminated in the electric furnace, are high metal losses and low thermal efficiency. There are also other points, but they are more or less contributary to the two mentioned. Nearly all these troubles, including the high metal loss, are due to the gases of combustion and difficulty of temperature control. In brass melting, for instance, it is very difficult to obtain the proper atmosphere and temperature inside the fuel furnace, with the result that the zinc is either oxidized by the gas or volatilized by too great heat. The same is true of other metals used as alloys, such as tin, or lead, all of them being readily oxidizable at the temperature necessary for melting and pouring. In fact the metal loss of the fuel-fired furnace is in the neighborhood of from 2.5% to 8%, as compared to 1.5% or 0.75% for the electric furnace, depending on the metal.

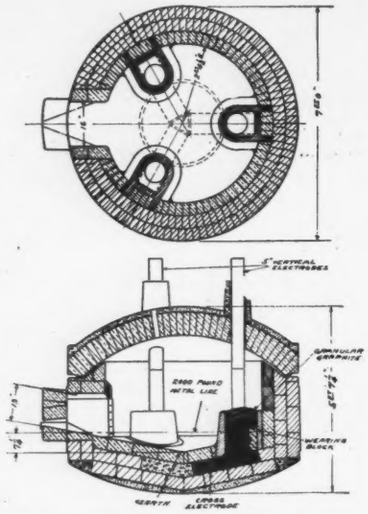
The reason for this is that in the

View of 1500-lb. Furnace With Roof Lifted.

electric furnace of this type the metal is not subjected to excessively high temperatures nor to an oxidizing atmosphere. There are no gases of combustion, and the metal never comes in contact with the arcs. Also, the flexible and accurate temperature control makes it possible to obtain exactly the right temperature without danger of volatilization. The expense for recovery of metal from ashes and slag is greatly reduced by the use of an electric furnace. As to the comparative thermal efficiency, that of the electric furnace ordinarily ranges from 30 to 80%, depending on operating conditions. Under the same conditions the efficiency of the fuel-fired furnace ranges from 1.5% to 16%, the average being 7%.

Not the least of the advantages of the electric furnace are those which

influence shop conditions for the better. The absence of dirt and the fumes both from the metal and from burning fuel make the shop atmosphere much more bearable; in addition the electric furnace is practically noiseless. Furthermore, there is comparatively little external heat radiation, and the temperature of the foundry is not raised appreciably. Creating improved shop conditions means improving the quality and amount of work turned out, which all goes to benefit everyone concerned.



Sketch Showing Dimensions of Non-Ferrous Melting Furnace.

How a Capillary Oiler Works

The action of the capillary oiler with hangers and pillow blocks is one of the simplest processes for perfect and dependable lubrication ever known, but when the average millwright or mechanic is asked just how the process works out he is often at a loss to clearly explain just how it occurs.

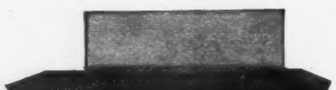


Fig. 1

The Dodge Mfg. Co. of Mishawaka, Ind., was the first manufacturer and original patentee of the capillary oiler, and for the past 30 years has sold hundreds of thousands of these oilers. This organization has worked out one of the clearest explanations of just how they have hooked up one of the primal laws of nature and made it work out a lubrication problem that has enabled industry to secure a dependable and positive lubrication.

Fig. 2

The test is fully explained in the first four figures which accompany this article, and the test is so simple that it can be carried out by any one interested, with the most simple of apparatus.

Fig. 1 shows a tray filled with lubricating oil in which are placed two glass plated, standing parallel, but not touching. As shown, the oil has risen between the plates to a height above the surface of the oil in the tray, proportionate to the distance between the plates.

Fig. 3

Fig. 2 carries the experiment another step. The same plates as shown in the first illustration are made to touch at their right hand ends only. Note how the oil has risen to the top of plates at the point of contact. These plates are exactly in the same relative positions as the surfaces of the Dodge capillary bearing.

Fig. 4

In Fig. 3, a strip of glass has been laid across the top of the two plates, representing the relative position of the shaft in a bearing lubricated by a capillary oiler. It will be noted that the increased rise of oil partially covers the top plate. Oil evidences the same tendency to cling to the shaft in a bearing.

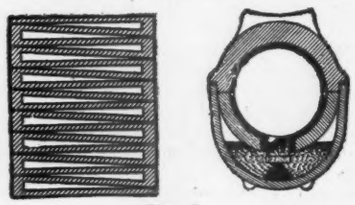


Fig. 5

In Fig. 4, the plates have been removed from the tray. A spoon supported ⅛-in. above the surface of the oil was depressed to touch the oil and was then allowed to spring back to its original position—the oil followed as shown. This is exactly the same action that takes place when the level of the oil gets below the bottom of a Dodge capillary bearing.

Figs. 5 and 6 are self-explanatory and give a clear idea of how the oiler acts on the same principles involved in the first four illustrations.

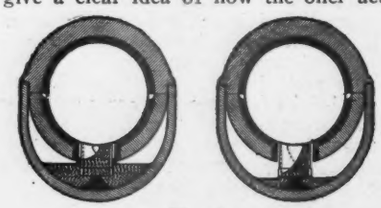


Fig. 6

All in all, the capillary oiler has the following advantages: it provides a definite and positive form of dependable lubrication that is bound to work just as long as the law of capillary attraction works; it is a non-agitating oiler and this means that the oil always remains quiet in the reservoir, permitting all sediment to settle, and thus assures a constant flow of clean and pure oil to reach the wearing surface of the shaft. It has the further advantage of not requiring attention any oftener than six months. At the end of this period, all oil should be drained off and the shaft cleaned, and new oil placed in the reservoir.

Application and Maintenance of Portable Electric Drills.

The portable electric drill is essentially an electric motor, and should be given all the protection and considera-

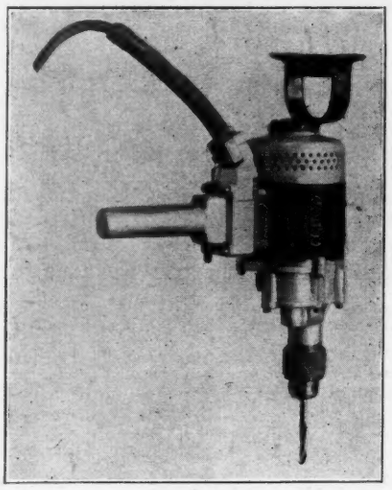


Fig. 1.—A Typical Portable Electric Drill of Medium Size.

tion usually required for such apparatus, according to E. L. Connell, chief engineer of the Van Dorn Electric Tool Co., Cleveland. His further comments are as follows:

The small-size drills in common use are equipped with a universal motor and drive the chuck through a train of gears which reduce the speed from five to 25 times. The power is supplied through a flexible cable with lamp-socket connection and is controlled by a switch conveniently located on the handle of the drill. A typical machine of medium size would weigh 10.5 lbs. and be capable of drilling 5-16 in. holes as fast as the operator can force it through the work.

The capacity of electric drills is based on the power and speed requirements of a carbon-steel drill drilling in .20 to .30 carbon steel. It is evident that the capacity of such a machine will vary with the material, also that the speed for maximum production will change with conditions, but by standardizing on the above method of rating manufacturers have done much to aid the prospective purchaser in comparing and selecting the tool. The maker can readily recommend the proper tool for special applications, such as wood boring, where the capacity of the tool may vary widely from its rated capacity in steel according to the material, depth of hole, etc.

The speed indicated on the name plate is the free-running speed, and bears no definite ratio to the speed under load. The speed will drop from 25 to 50% or more under load. It is not generally appreciated that this characteristic automatically adjusts the speed of the machine to correspond with the size of drill being used and the hardness of

the material. An operator who has become acquainted with the tool will have no use for a two-speed machine with gear-shifting mechanism. The greater simplicity and ruggedness of the single-speed tool would even justify some sacrifice if a compromise were necessary. The important factor in obtaining the best performance from an electric drill is the feed pressure. The feed pressure required for drilling in steel to the full capacity of the tool is greater than can be exerted by hand for all except the smallest sizes, and even in the small sizes made by the leaders of the industry there is enough power to operate the drill under all the pressure a heavy man can exert. A pressure of 500 lbs. is seldom too much for a 0.5-in. machine drilling in steel. A feed screw is, therefore, usually supplied with the larger tools.

The minimum drilling performances of a universal drill with carbon-steel drills in .20 to .30 carbon steel should be as indicated in the accompanying table. The operating speed represents a cutting speed of 50 ft. per min.

MINIMUM DRILLING PERFORMANCE OF UNIVERSAL PORTABLE ELECTRIC DRILLS.*

Capacity of tool and size drill.	Speed r.p.m.	Rate of feed in in. per min.	Horsepower at 1 hp. per cu. in. metal removed per min.
0.250.....	800	1.50	0.08
0.312.....	650	1.37	0.10
0.375.....	525	1.25	0.13
0.500.....	375	1.00	0.19
0.625.....	300	0.75	0.23

*Carbon steel drills in .20 to .30 carbon steel.

The free-running speed will be about twice the speed given in the table, except where the tool is designed for a lower cutting speed. The capacity of the motor should appear on the name plate in amperes, and the motor should be capable of carrying this load for 30 min. without overheating. Insofar as the motor is concerned the temperature reached in this time may be 50 deg. C. (90 deg F.) above the room temperature. The high armature speed gives an excellent opportunity to make use of forced ventilation, and with a well-designed fan the cooling system is very efficient. The nature of the work is such that full capacity of the motor is never required for 30 min. without relief, so if the tool will stand this test there will be no objectionable heating. The ampere capacity is not always given, in which case a test by competent engineers is the only method of checking the power and heating characteristics. The efficiency will vary between 40 and 60%, according to size and design, at a load which reduces the speed to about the figure given in the table.

In checking the performance of a universal motor the test should be made on 60-cycles alternating current. A motor of this type is similar to the direct-current series motor in its characteristics, but its construction is altered to permit operation on alternating current. These structural differences include lamination of the field magnetic circuit, often a slotted field design with the winding distributed in slots, a high ratio of armature to field turns, and a large displacement of the brushes from neutral position. These special features are all used to reduce the reaction of the windings and maintain the power on alternating current. The power on alternating current will always be less than that obtained with the same direct-current input. Manufacturers of this type of motor usually do not recommend them for use on frequencies over 60 cycles, because the efficiency drops very rapidly with increasing frequency. The lower the frequency the more nearly do the characteristics on alternating and direct current coincide. It will be found that when the machine is operated on high-frequency circuits the power will be deficient and the heating excessive.

Brushes used on drill motors are usually chosen only after exhaustive tests on the part of the maker to obtain the best performance and the longest life. It is, therefore, imperative that only such brushes be used as are furnished by the maker for the particular machine. A brush made from "any material at hand" may ruin the motor. Some of the effects possible are overheating from friction, sparking or high resistance. If the material is too hard the friction and wear on the commutator is excessive, and if too soft the mica may wear high and bring on chattering and destructive sparking. If the resistance of the brush is too low excessive short-circuit current will cause sparking and overheating of the commutator and armature coils; and if the resistance is too high the normal current may overheat the brush. The life of the brushes cannot be stated in ordinary terms because of the very great variation in the use of the tool. However, it is best to examine the brushes before the expiration of 200 hrs. actual running time, and it will be a help to clean the commutator with fine sandpaper several times during the life of the brush. Tension on the brushes should be uniform and just sufficient to prevent arcing on a smooth commutator. A tension of at least 4 lbs. per sq. in. of brush contact is usually necessary. Should the commutator become rough the armature should be removed and the commutator refinished by taking a very light cut on a lathe.

All reputable tools of this type have enough power to prevent stalling except under accidental circumstances. When this does happen through bending a drill, or other accident, the power should be cut off as soon as possible, but momentary stalling of this kind will not injure a well-designed machine. The part most apt to fail under these circumstances is the switch, which must then act like a circuit-breaker. Quick break and generous contact area are very important requirements. Some tools are equipped with fuses for such emergencies, but as the operator usually replaces them with copper wire because a fuse is not immediately available their practical value is rather doubtful.

Fig. 2.—Portable Drill in Operation in a Piano Factory.

Sometimes when drilling sheet metal the lip of the drill will catch as it breaks through, stalling the machine. This trouble can be prevented by grinding the drill especially for this work. The angle of the point should be reduced to give a longer point—59 deg. is the standard angle—and the sharp angle at the cutting edge should be ground off slightly to give the same result as a smaller angle of the spiral flute to the axis of the drill. This latter procedure alone may also help to prevent "grabbing" in soft material, and will allow high feed pressures without chipping the cutting edges in very hard material. For drilling in wood the type of drill will depend upon the condition and kind of wood and the depth of the hole. Very deep holes require the ship auger. When drilling green wood the hole should be cleared several times if the depth of the hole is many times the diameter. In soft dry wood the speed and size of hole which can be drilled with these little machines is amazing. This matter of choosing and conditioning the drill is a very important one, and can best be solved by the mechanic on the job.

The better class of tools are grease lubricated, which means maximum cleanliness and minimum attention. It is

Fig. 3.—Portable Drill in Automobile Work.

good practice to replenish the grease supply as often as the tool is cleaned or inspected, which, on account of the brush wear, should not exceed 200 hrs. of service.

Many good machines have ball-bearing armatures. These armatures operate without load at from 10,000 to 18,000 r. p. m., and a poor bearing would mean destructive vibration. On the slow-speed members—the compound gear shaft and chuck spindle—plain bronze bearings of ample size have given perfect service, but there is a tendency toward the use of ball bearings on these members as well. The danger in this move is in the overloading through lack of room to use bearings of sufficient capacity. The thrust is an important item which must be taken up

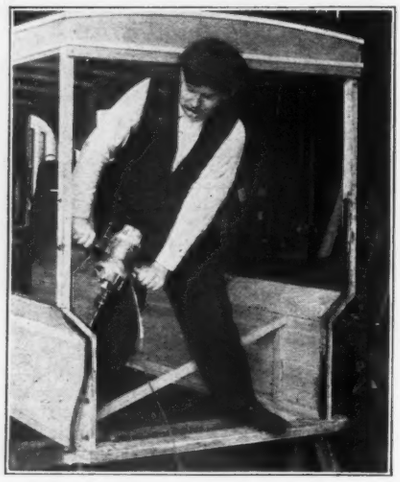


Fig. 4.—Portable Drill in Auto-Body Drilling.

in a ball bearing of the direct-thrust type, or of the angular-contact type capable of carrying both thrust and radial loads.

The armature is the delicate part of any motor of this type, and it is the first part to examine should the machine show signs of distress. Very often a motor is completely burned out through neglect of symptoms of developing trouble. If severe sparking appears at the armature the machine should be taken out of service at once and sent to a competent electrician for inspection. These motors are subject to the ordinary diseases of electric motors, which may be detected in the usual way. Grounds may be detected with the magneto ringer, and if no ground is detected in the armature the field, switch and cable connections should be tested. An open circuit in the armature will be shown by burning between the commutator bars to which the open coil is connected. A short within a coil will burn out the shorted turns, and a short between commutator bars will overheat the bars so shortened. A case of short between bars may sometimes be repaired if discovered before the coil is burned by removing the foreign substance between the bars. If the armature is built with open slots and form-wound coils the repair can often be made economically by the average repair man, if he purchases the repair coils from the maker. If the armature is built with semi-closed slots it will probably be best to return the tool to the maker for repairs. The maker's guarantee of correct work is quite valuable; hence it is strongly recommended that the maker be asked to make repairs.

Fields are not apt to fail, but occasionally they are burned out by operating the tool after the armature has failed. A shorted coil will cause overspeed or flashing when the switch is closed. Rewinding the field coils is simple providing the coil is kept within the original dimensions and properly fastened into position. The best tools have windings treated with an impregnating varnish by an elaborate process. The gearing of good machines seldom gives trouble, but they are wearing parts and should be renewable with the least trouble and expense. The removable armature pinion is a valuable feature, since it permits renewal of this part without the cost of a new shaft and rewinding, which is the case when the pinion is integral with the shaft.

Cable connections are often abused by using them to drag the tool around, etc. Some cable is better than others, but all of it requires reasonable consideration, and where the tool is used in one position on production work it is recommended that the tool and cable be suspended from above with a counter weight. The machine is then always accessible and free from cable abuse. Some tools are provided with terminal screws to which a new cable can be attached without the aid of a soldering iron.

The weight of a portable electric drill is an important consideration, but the lightest tool may prove expensive to maintain. Weight is reduced by increasing the armature speed, by the use of aluminum housings, and by the use of the best steels, properly treated. A radical armature speed will shorten the life of the tool, and the only assurance of proper design and material in the gear train is the reputation of the maker. It should also be borne in mind that the aluminum housings may be crushed by pounding or dropping the tool. Such caution may be unnecessary, but it is appalling what abuse some tools receive in this manner.

Portable electric drills, as manufactured by the recognized leaders in the industry, are built to machine-tool accuracy of the finest materials and are distributed in a manner that gives the purchaser more for his money than is possible in many other lines. They are built by mechanics for the use of mechanics; they are practical, rugged machines that will save many hours in miscellaneous drilling operations and are indispensable in production where the drill must be taken to the work.

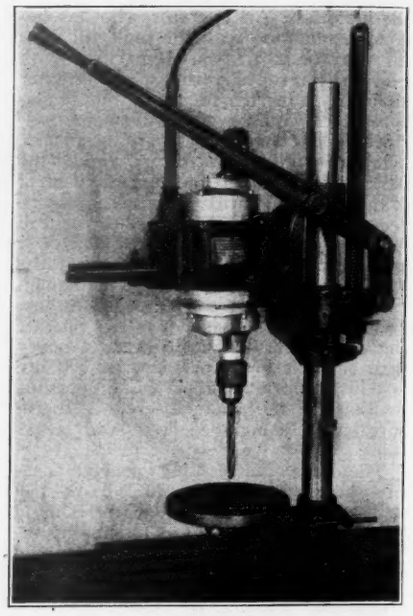


Fig. 5.—Portable Drill Affixed to Standard for Use as Permanent Tool.

Addition to Violet-Ray Machine Products.

The Bleadon-Dun Co., 213 South Peoria street, Chicago, has added "The Baby Violetta" to its Violet-Ray machine products, a description of which follows: The magnet coil and adjustment is mounted on a handsomely lined and covered carrying case, size 10 by 5.5 by 3 ins., with beveled edges and nickelplated hardware. A specially constructed Tesla coil is contained in a neat handle composed of highly polished insulated hard rubber, which is shock-proof. In size it is 8 ins. in length and 1.75 ins. in diam. It is equipped with 7 ft. of cord to lamp socket and 6 ft. of heavy cord to the handle. The device is furnished complete with carrying case, cords, general electrode and yearly guarantee, the weight of the machine being 3 lbs.

"The Baby Violetta" Machine Developed by Bleadon-Dun Co.

ACTIVITIES IN THE TRADE

Business Developments, Sales Agencies, Trade Literature and Miscellaneous Items Concerning Electrical Manufacturers and Allied Business Interests

Tygert-Simonson Battery Co., New York City, has filed notice of change of name to the J-E Battery Co.

Auto Service Battery & Electric Co., Pittsburgh, has filed plans for the erection of a 1-story building at 7601 Penn avenue.

The Superheater Co. has announced that after May 1 its general offices will be moved from 30 Church street to 17 East 42d street, New York City.

New York Electrical Trade School, 39 West 17th street, New York City, has filed notice of increase in its capital stock from $3000 to $75,000 for expansion.

Northwestern Electric Co., 35 Vesey street, New York City, will remove its works to larger quarters at 379-83 Washington street, recently acquired, on May 1.

Aetna Electric Appliance Co., Boston, has issued a folder on its "Hot-vent" electric water heater, which illustrates and describes the advantages of this equipment.

Novelty Lamp & Shade Co., 2490 East 22d street, Cleveland, manufacturer of art lamps, shades, portables, floor lamps and lanterns, has issued catalog No. 37 covering its line of porch lights, brackets, pendants and portable table lamps.

Allen-Bradley Co., Milwaukee, manufacturer of electric controlling devices, has announced that its Cleveland office has been moved from the Citizens building to the Bangor building, 942 Prospect avenue. This change was necessitated by the fact that the Citizens Bank has taken over its entire building for offices. The Cleveland office of the company is in charge of H. A. Stevenson, who is assisted by W. L. Jaeckel.

Thomas A. Edison, Inc., West Orange, N. J., manufacturer of electrical products, is said to be planning the erection of a plant at Green Island, near Troy, N. Y., in the vicinity of the proposed plant of Henry Ford, Detroit. Electrical service for the factory will be secured from the hydroelectric power plant to be erected at Troy by the Ford interests, plans for which have been completed by Stone & Webster, Inc., 147 Milk street, Boston.

Cutler-Hammer Manufacturing Co., Milwaukee, has issued a leaflet on "C-H Iron-Clad Solenoids," which describes electric solenoids for operating brakes, clutches, valves and similar devices where a straight-line motion is desired. These solenoids, it is stated, are weatherproof and the usual hammer blow and noise accompanying the operation of solenoids are largely eliminated by the use of a floating plug, which the plunger engages at the end of its stroke. The plug also provides a high pull and a fixed position for the plunger when sealed. An equalizer bushing prevents excessive wide pull on the plunger. The solenoids are furnished in four sizes, the maximum gross pull of the largest size being 400 lbs.

Bacharach Industrial Instrument Co., Pittsburgh, has recently moved into its new quarters at 7000-6 Bennett street, Homewood Station, comprising a brick building of 18,000 sq. ft. of floor space. The additional space which was acquired by the purchase of this building has increased considerably the company's facilities

New Building of Bacharach Industrial Instrument Co.

in giving prompt and efficient service to its customers. The products handled by the company consist mainly of pressure recorders, draft recorders, pitot tubes and orifices, CO_2 indicators, manometers, engine indicators, air and gas meters, etc. Manometers and engine indicators have recently been added to the company's line, and are illustrated and described in pamphlets G and M, issued by the company. The manometers shown in bulletin G may be arranged for either pressure, draft or differential pressure. The engine indicator described in pamphlet M can be furnished for revolution up to 1500 per min. This device is utilized by users of Diesel automobile and airplane engines, etc. The Bacharach Industrial Instrument Co. states that type two indicator, usually applied to Diesel engines, may be furnished with a power integrator, which will give automatically the mean indicated horsepower.

P. A. Geier Co., Cleveland, has issued its "Royal Newspaper Ad Sheet," the principal feature being instructions to dealers handling "Royal" cleaners on how to build their own newspaper advertisements. "It is the company's 1921 policy," states F. J. Gottron, general manager, "to aid the dealers in advertising themselves locally in building up their individual prestige and in making their stores the electrical headquarters of their particular communities." In pursuance of this policy the "Royal Ad Sheet" contains not only a certain number of "ready-made" newspaper advertisements for the dealer, but also brief directions as to how he may easily create his own ads. Suggestive paragraphs, phrases and sentences which he may use are given and cuts are supplied for this purpose. The sheet also contains a number of articles designed to be printed on the women's magazine pages of the newspaper.

Triumph Electric Co., Oakley, Cincinnati, O., manufacturer of "Triumph" motors, is well equipped to take advantage this year of the unusual demand for refrigeration machinery. Because of the general shortage of ice during the past winter the solution of the problem is being found in motor-operated refrigerating plants and artificial ice machinery. An installation by the Triumph Electric Co. was featured on page 647 of the April 23 ELECTRICAL REVIEW.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has issued leaflet 3436, which describes and illustrates the automatic electric ovens for commercial baking of pies, bread, cakes and pastry. This leaflet is printed in two colors and gives in detail the construction and advantages of the use of electric ovens in public bakeries, hotels, meat and packing plants, restaurants, public institutions, such as state hospitals, large industrial plants and private plants.

Merchant Shipbuilding Corp., Chester, Pa., plans to convert a portion of its shipyard into a plant for the manufacture of engineering products. It is proposed to specialize in the construction of power-plant equipment, as well as Diesel engines, for which the company is licensed in this country. A number of changes will be made at the plant to accommodate the new line of production, including the installation of necessary equipment. The property covers a site of about 50 acres, and represents an investment of $6,500,000. J. L. Ackerson is vice-president in charge of operations.

R. W. Lillie Corp., 30 Church street, New York City, sales engineer, has opened a branch office in the Engineers building, Cleveland, with C. H. Purdy, a technical graduate experienced in designing and construction work and formerly connected with the Springfield (O.) Light, Heat & Power Co., in charge of this office and territory. This corporation is associated with the Jeffrey-Dewitt Insulator Co., Maring Wire Co., Electric Power Equipment Corp., Collyer Insulated Wire Co., and other manufacturers, and the establishing of this Cleveland office is for the purpose of concentrating the sales efforts of the company in Ohio for the sale of the products of associated manufacturers. District offices are already in operation in Boston and New York City, and plans are now being formulated for opening an office in Pittsburgh.

PERSONAL MENTION

Biographical Sketches and Chronicle of Changes in Business Connections, Promotions and Other Personal News of the Industry

H. E. EISENMENGER, who was formerly with the Techno-Service Corp., has become connected with the rate department of the New York Edison Co., Irving place and 15th street, New York City.

A. J. PATRICK has been appointed superintendent of the Piqua (O.) district of the Dayton Power & Light Co. He has been with the Dayton organization for the past 10 years, and his present position is a promotion from the maintenance department.

D. A. HEGARTY has been appointed manager of the Brush Electric Co., Galveston, Tex., to succeed W. R. Phipps, who has been transferred to the New York office of the company. Mr. Hegarty was formerly connected with the Western Light & Power Co., Boulder, Colo.

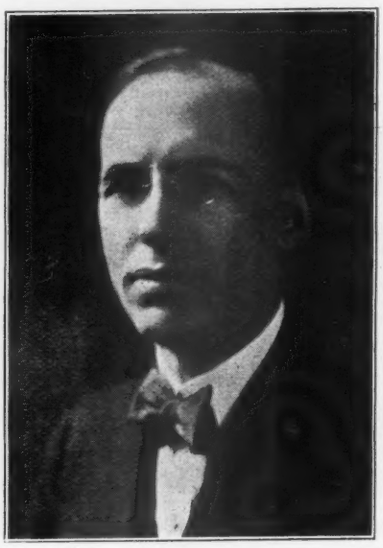
SHIRAS MORRIS, recently elected president of the Associated Manufacturers of Electrical Supplies, and president of the Hart & Hegeman Manufacturing Co., Hartford, Conn., has been elected treasurer of the Electrical Manufacturers Council for the unexpired term of the late Edward B. Hatch.

W. I. MIDDLETON, electrical engineer for the Simplex Wire & Cable Co. of Boston, was the speaker at an illustrated lecture given recently before the Urbana section of the American Institute of Electrical Engineers at the University of Illinois, Urbana, Ill., his subject being "Insulated Wires and Cables."

DR. COLIN G. FINK, South Yonkers, N. Y., who organized and directed the research laboratory of the Chile Exploration Co. for the past 4 years, has resigned his position. He recently invented an electrical process for the reduction of tin ores. His new insoluble anode is now being introduced at the electrolytic copper refinery at Chuquicamata, Chile. Dr. Fink was formerly connected with the General Electric Co.

DWIGHT TENNEY, chief engineer of the Franklin Baker Co., New York City, and formerly connected with the engineering staff of the National Biscuit Co., has become head of the newly-organized department of engineering of the Pease Laboratories, Inc., 30 West 38th street, New York City. He will continue with the Franklin Baker Co. as consulting engineer, having charge of all technical development work, and his previous experience in plant and machine development in the food industry qualifies him for his new work.

LOUIS T. KLAUDER, who has resigned from the Philadelphia Rapid Transit Co. as construction engineer to enter the consulting engineering field, is a graduate of the Williamson School and of the Drexel Institute in Mechanical and Electrical Engineering. He entered the engineering department of the Pennsylvania Iron Works Co. in 1901, and became associated with the Philadelphia Rapid Transit Co. in 1905, with which company he has occupied in turn positions of draftsman, chief draftsman, assistant engineer and construction engineer, in charge of plant design and construction. In his consulting work he will specialize in that field of engineering in which he has been most active and progressive. Like many of the more successful engineers, he has kept in close contact with the advances of his profession through membership in major engineering societies with which his activities are associated, being a member of the American Society of Mechanical Engineers, American Institute of Electrical Engineers and the Engineers' Club of Philadelphia. Through the organization of an office as unusual as it is distinctive, Mr. Klauder is already directing a number of municipal industrial power-plant developments, among which are the new water and lighting plants of the city of Jamestown, N. Y.



L. T. Klauder.

OBITUARY.

WILLARD L. CANDEE, retired insulated wire manufacturer and a pioneer in promoting the popular use of the telephone, died of heart failure April 24, in New York City. He drove from the Hotel Marie Antoinette on Sunday afternoon to visit friends at Great Neck with his wife, daughter and granddaughter, Mrs. G. H. Potter and Miss H. Potter. Mr. Candee, who was 70 years old, enjoyed the trip in the spring air so much that the chauffeur was directed to drive to Babylon before starting home. On the return journey, as the car was nearing New York City, Mrs. Candee noticed that her husband had, as she supposed, fallen asleep. When the car reached the hotel where the Candees had made their winter home for some time, Mrs. Candee shook her husband gently, but could not arouse him. For several minutes efforts were made to restore him to consciousness and then the chauffeur was directed to go for the family physician, Dr. Herbert P. McGregor, who after a quick examination told Mrs. Candee that her husband had died of heart failure. Mr. Candee was born in Yonkers, N. Y., moving to Brooklyn at the age of 16 years, where he became interested in the telephone when it was still a novelty and a curiosity. He organized the original telephone company in New York City and did much of the pioneer work of making the public acquainted with it. He sold out his interest long before the public responded to the first work of cultivating its interest in rapid communication. Mr. Candee also did much experimental work in protecting exposed wires, which gave much trouble because of being put out of commission by the elements, or by contact with water mains and other metallic conduits. With Charles A. Cheever he founded the Okonite Co. in the early eighties, which soon became a very successful and well-known producer of "Okonite" insulated wires and cables. Mr. Candee was very active in this company, organizing branches in European and other countries, and was president of the company until some 5 years ago, when he retired from active work, although remaining as vice-president of the company until the day of his death. He possessed a very wide acquaintance, particularly among the pioneers in all branches of electrical work. He was captain of Company B in the famous 23rd Regiment of Brooklyn, and his company was known as one of the best drilled in the state of New York. Captain Candee had won many medals as a marksman, carrying off the highest honors as a sharpshooter. He is survived by his widow and four children and several grandchildren. The family was quite prominent in Brooklyn society for years.

LESTER GRAY FRENCH, for 13 yrs. assistant secretary of the American Society of Mechanical Engineers, died in New York City, Apr. 18, following an operation. He was born at Keene, N. H., in 1869, and was educated at the Massachusetts Institute of Technology. After graduation he served as an instructor at the International Correspondence Schools in Scranton, Pa., for a number of years and later became identified with the Builders Iron Foundry in Providence, R. I. He acted as editor-in-chief of *Machinery* for 2 yrs., but in 1906 resigned to publish a number of technical books on mechanical engineering subjects, including the earliest American treatise on the steam turbine. Mr. French was made editor of the American Society of Mechanical Engineers publication—*The Mechanical Engineer*—in 1908 and joined the American Society of Mechanical Engineers in 1912.

BUSINESS OPPORTUNITIES

News of Electrical Construction Projects in All Parts of the Country, Proposals Invited, Foreign Trade Openings and New Companies

EASTERN STATES.

New Sweden, Me.—The New Sweden Light & Power Co. has been organized to operate a local electric power plant with distributing lines in this section. John N. Johnson is president.

Rutland, Vt.—The Rutland Railway, Light & Power Co. has arranged for the installation of a new 500-kw. rotary converter at its local substation. The machine will replace two smaller units.

Rutland, Vt.—The Vermont Hydroelectric Corp. has arranged for the installation of a new 1250-kv-a. generator at its hydroelectric plant, known as Glenn Station. The plant comprises three waterwheel units, the present installation being the third.

North Dighton, Mass.—Considerable electrical equipment will be installed in the new 1-and 4-story addition to the plant of the Mt. Hope Finishing Co. on Spring street, to be used for textile production, and estimated to cost $250,000.

Winchester, Mass.—Beggs & Cobb are having plans prepared for the erection of a 1-story power house.

Georgetown, Conn.—Electrical equipment will be installed in the two buildings to be erected at the plant of the Gilbert & Bennett Manufacturing Co., manufacturer of wire cloth, etc., to comprise a 1-story galvanizing shop, 38 by 86 ft., and a 1-story annealing plant, 50 by 100 ft. A traveling crane will also be installed.

Providence, R. I.—Electrical equipment, refrigerating machinery and other mechanical equipment will be installed in the 2-story plant to be erected by the Sunshine Ice Cream Co., 372 Cranston street, and estimated to cost $80,000 with equipment.

Binghamton, N. Y.—The Dunn & McCarthy Shoe Co. has discontinued the operation of its isolated power plant, and in the future will utilize the central-station service of the Binghamton Light, Heat & Power Co. The load of 500 hp. will be carried on the central-station lines.

Brooklyn, N. Y.—J. L. Hopkins & Co., 477 Keap street, drug products, are taking new bids for the erection of a 1-story power house at their factory.

Buffalo, N. Y.—Electrical equipment will be installed in the 1-story mechanical laundry, 72 by 100 ft., to be erected by the Marine Laundry, at Moore and Miami streets. Harry J. Hutchins is president.

Buffalo, N. Y.—Commissioner of Public Works Arthur W. Kreinheder received bids, April 28, for the instalation of new transmission lines in certain sections of the city; for electrically operated control for valves, and other equipment.

Ithaca, N. Y.—Electrical and mechanical equipment will be installed in the 4-story and basement chemical building to be erected by Cornell University, on East avenue, estimated to cost $2,000,000. Henry R. Kent, 141 Broadway, New York City, is steam and electrical engineer for the work.

Long Beach, N. Y.—The Village Council has authorized Ophuls, Hill & McCreery, consulting engineers, 112-14 West 42nd street, New York City, to prepare plans and specifications for its proposed municipal electric power plant, estimated to cost in excess of $125,000.

New York, N. Y.—The New York Edison Co. has received the contract for furnishing electrical service in the new Curb Market building, now in course of erection at 78-86 Trinity place, extending to Greenwich street. The installation will comprise 147 hp. for mechanical operation and 1200 lamps for illumination.

Old Forge, N. Y.—The Village Council has plans under way for the construction of its proposed municipal light and power plant, and electrically operated pumping station, estimated to cost $50,000. H. Powell is engineer.

Rossie, N. Y.—The Rossie Electrical & Manufacturing Corp. has been granted permission by the Public Service Commission to issue stock for $41,500, the proceeds to be used for extensions and improvements at its power plant.

Silver Creek, N. Y.—The Silver Creek Electric Co. has made application to the Public Service Commission for permission to make extensions in its transmission stystem to furnish service at Forestville, Chautauqua county.

Troy, N. Y.—The Ford Motor Co., Detroit, has awarded a contract to the Troy Public Works Co., Utica, N. Y., for foundation work for its proposed hydroelectric generating plant at Green Island, near Troy, to be used in connection with a new automobile and tractor manufacturing plant at this place. The station will be 80 by 250 ft., with installation to constist of six 11,000-kw. generators. Stone & Webster, 147 Milk street, Boston, are the engineers.

Butler, N. J.—Electrical equipment will be installed in connection with the proposed sewerage system, including disposal plant, to be constructed by the Borough Council. The cost is estimated at $100,000, of which amount the sewerage disposal plant is expected to cost about $54,000, with equipment.

Florence, N. J.—Electrical equipment will be installed in connection with the proposed waterworks system to be constructed by the Township Committee. The system is estimated to cost $100,000.

Rockaway, N. J.—The New Jersey Power & Light Co., Dover, N. J., has completed the installation of a number of new street lamps at Rockaway, totaling about 600 cp. An installation has also been made of new street lamps at Succasunna, Roxbury township.

Milford, Del.—New equipment will be installed at the local power plant of the Milford Electric Co., including steam turbine and generator.

Erie, Pa.—The Public Service Commission has approved a merger between the Erie Lighting Co. and the C. D. Electric Co. The new organization will operate with a capital of $2,650,500. E. D. Carter is president and Milward Oliver, treasurer.

Gettysburg, Pa.—Considerable electrical equipment will be installed in the new silk mill to be erected here by J. H. & C. K. Eagle, Inc., Shamokin, Pa. The mill will be 1-story, 95 by 160 ft., and is estimated to cost $100,000.

Harrisburg, Pa.—Considerable electrical and mechanical equipment, as well as refrigerating apparatus will be installed in the cold storage plant to be erected by the American Cold Storage Co. on South Second street.

Hazelton, Pa.—The Pennsylvania Power & Light Co., Allenton, has arranged to furnish power to the Lehigh Traction Co., for the operation of its lines in the Hazelton section. Service will be secured from the Pennsylvania company's plant at Harwood, and necessary extensions and connections will be made in the lines. The company is planning to experiment with the use of silt as fuel at the Harwood plant, and if satisfactory, the boilers at the station will be equipped to handle fuel of this character.

Newton Square, Pa.—The board of directors of the Dunwoody Home for Convalescents, has had plans prepared for the erection of a power house at the institution.

Philadelphia, Pa.—The Reyburn Manufacturing Co., manufacturer of tags, etc., will install new boiler and other equipment at its power house.

Reading, Pa.—The Reading Hospital Commission is having plans prepared for the construction of a power house at the institution, to be located at Front and Spring streets. A new mechanical laundry plant will also be erected. Isaac H. Francis, Otis building, Philadelphia, is engineer for the work.

Watsontown, Pa.—Manufacturers of this city are proceeding with a survey of the project of erecting an electric light and power station to serve their plants, and preliminary estimates are now being made. The plant if built will be of sufficient capacity to furnish light to the borough.

The estimated cost of the project is $150,000. Address the mayor.

Baltimore, Md.—Considerable electrical and mechanical equipment will be installed in the proposed paper manufacturing plant of the Gwynns Falls Paper Co., 517 Equitable building, at Gwynns Falls. The company was recently organized with George W. Davis as head. The new mill will be 1-story, and is estimated to cost $250,000 with machinery. Joseph H. Wallace & Co., 5 Beekman street, New York City, are engineers for the project.

Cumberland, Md.—A quantity of electrical equipment, including a generating plant, will be installed by the Paragon Motor Car Co., Connellsville, Pa., and Century building, Cleveland, at its proposed new automobile manufacturing plant at Cumberland. The company has selected a local site, and plans are under way for the erection of a group of buildings, estimated to cost about $1,000,000 with machinery. The company will establish local offices in the First National Bank building.

Easton, Md.—All machinery to be installed in the new plant addition to be erected by the Atlas Wheelbarrow & Truck Co. will be electrically operated.

Hagerstown, Md.—In accordance with permission granted to the Hagerstown & Frederick Railway Co., by the Public Service Commission, bonds have been issued in an amount of $1,600,000, the proceeds to be used for reimbursement for former expenditures, as well as general operations, necessary extensions, etc.

Langley Fields, Va.—The Quartermaster Department of the Army, Washington, D.C., has taken bids for the construction of two radio towers for its wireless system in this section.

Saltville, Va.—The Saltville Electric Co., recently organized, will operate a local light and power system. The company is headed by J. K. Wilson, president, and E. C. Scott, secretary.

Barracksville, W. Va.—The Le Mar Coal Co is planning the installation of considerable electric equipment at its local properties. The company plans to develop a tract of over 400 acres.

Charleston, W. Va.—The Cameva Coal Co., Masonic Temple, recently organized with a capital of $200,000, is planning the installation of electrical and mechanical equipment at its properties. W. I. Campbell is president and F. W. McConnell, vice-president.

Petersburg, W. Va.—The Community Power Co. has been incorporated with a capital of $50,000 to operate a local power plant, with distributing lines in this section. The incorporators are H. W. Sites, A. J. Welton and Charles J. Zell.

Landrum, S. C.—The Common Council has plans under way for the construction of a municipal electric light and power plant.

Gulfport, Fla.—Bonds to the amount of $13,000 have been voted for street lighting and sewer purposes, pier and yacht-basin construction. The electric energy will be supplied by the St. Petersburg Lighting Co. Address S. J. Webb, town clerk.

NORTH CENTRAL STATES

Barberton, O.—Bids will be opened May 2 for the lighting of the east side of the city. Address the mayor.

Cincinnati, O.—Preparatory to puchasing operating power for the Union Gas & Electric Co., the traction company asked William C. Culkins, street-railway director, to approve the expenditure of $380,000. The money will be used for equipment for seven transformer stations in different parts of the city. Three of the stations will work automatically.

Columbus, O.—A sum of $110,000 has been authorized by the City Council for the purchase of new boiler equipment for the municipal light plant. Address Service Director Duffey.

Ravenna, Mich.—Plans have been prepared by Holland, Akerman & Holland, engineers, Ann Arbor, Mich., for the construction of a hydroelectric power plant for the Ravenna-Conklin Electric Light & Power Co.

Bluffton, Ind.—The substation and interlocker at the junction of the Fort Wayne & Northern Indiana Traction Co. line and the Clover Leaf railroad was destroyed by fire recently, causing a loss of about $20,000.

Evansville, Ind.—Permission to issue $1,420,000 worth of bonds, bearing 7.5% interest, has been granted the Southern Indiana Gas & Electric Co. by the Indiana Public Service Commission.

Evansville, Ind.—The Board of Trustees of Evansville College plans to erect a power plant at the institution in connection with a new administration building. The estimated cost of the project is $400,000.

Belvidere, Ill.—A campaign has been started for the installation of a boulevard-lighting system in the business district. Address city clerk.

Centralia, Ill.—A "white way" project is under discussion here. Address secretary of the Rotary Club.

Dahlgren, Ill.—Plans have been prepared by Fuller & Beard, engineers, Chemical building, St. Louis, for the extension of the city's electric light and power plant. Address city clerk.

La Grange, Ill.—For the past 2 months the village trustees have been trying to secure a specific proposition for changing the street lamps to provide better lights. The plan is to replace the 60-candle power lamps at the street intersections for 100-candle power lamps and then put 60-candle power lamps in the center of each block.

Rockford, Ill.—The West End Improvement Association will meet shortly to decide whether or not there will be electric light service in that district.

Sterling, Ill.—A new ornamental curb-lighting system is being discussed. Address C. W. Tennant, chairman of the Curb Lighting Committee.

Fond du Lac, Wis.—The Park Board will improve the lighting system in Lakeside park. Address H. R. Potter, president of the board.

Griswold, Ia.—A plan is on foot to submit to the voters the question of issuing $50,000 in bonds with which to build a municipally-owned power plant. Address the mayor.

Clarksville, Mo.—The Clarksville Light & Water Co. has been organized with a capital of $20,000. A transmission line has been extended from Louisiana, Mo., to Clarksville.

Glenwood, Mo.—The Raven Coal Co. is planning the construction of a transmission line from its mining properties to Lancaster and Downing.

SOUTH CENTRAL STATES

Auxier, Ky.—The United Block Coal Co., recently organized with a capital of $100,000, is planning the construction of a steam-operated plant at its local properties. J. C. Snyder is president.

Walton, Ky.—The Dixie Light & Power Co. has been incorporated with a capital of $20,000 to install and operate a system in this section. The company is headed by Robert W. Jones and Charles Ransler.

Germantown, Tenn.—Plans have been prepared by Gaines & Carlisle, architects, Falls building, Memphis, Tenn., for the erection of a $17,000 electric light and water plant. Address P. S. McKee, mayor of Germantown.

Memphis, Tenn.—The city will vote May 19 on $10,000,000 bonds to purchase or construct a lighting and gas plant. Address W. B. Fowler, city engineer.

Memphis, Tenn.—The Cumberland Telephone & Telegraph Co. will install underground conduits in the Evergreen section at an estimated cost of $50,000. Address Frank Flournoy, manager.

Scooba, Miss.—Gerald Johnson has plans under way for the rebuilding of his electric lighting plant, recently destroyed by fire. New machinery will be installed.

St. Rose, La.—The Petroleum Export & Import Co., is planning the erection of a power plant at its local properties, with steam-plant for service. An electrically operated pumping plant will also be constructed. The company is a subsidiary of the Carson Oil Co., 29 South La Salle street, Chicago, of which Edward B. Carson is president.

Little Rock, Ark.—The Arkansas Light & Power Co. has plans under way for the installation of generating and other electrical equipment at its power plant; it is planned to double the present output. H. C. Couch is president.

Little Rock, Ark.—The City Council has perfected plans for the installation of new street lamps, including extensions in the system, to cost about $200,000. Plans are also under way for enlargements in the local electric power plant.

Bristow, Okla.—In connection with the improvement program being carried out by the Oklahoma Gas & Electric Co., and involving an expenditure of $30,000, thirty 400-cp.

lamps are being placed throughout the city, in addition to the street-lighting system now in use.

Hunter, Okla.—The Common Council has signed an agreement with the Oklahoma Gas & Electric Co., Oklahoma City, to furnish light and power service for the coming year.

Kaw City, Okla.—The Common Council has preliminary plans under way for the installation of new machinery in the municipal electric power plant, increasing the capacity to 300-hp. The local system will also be improved.

Ballinger, Tex.—Bonds have been voted for a municipal light plant. Address city clerk.

Highland Park P. O., Dallas, Tex.—The citizens will vote on $16,000 bonds to extend and improve the street and park-lighting system. Address H. R. Davis, mayor.

Stephenville, Tex.—The Texas Light & Power Co. is planning extensions in its local lighting system.

Whitney, Tex.—C. Gollihar is planning the rebuilding of his electric power plant recently destroyed by fire.

WESTERN STATES

Powell, Wyo.—An election will be held May 10 to vote on the question of issuing $17,000 electric light bonds. Address the mayor.

Livingston, Mont.—Application has been made to the Federal Power Commission by Fred M. Hjelde for permission to build a 7-ft. diversion dam and a 1600-ft. flume in Park county.

White Sulphur Springs, Mont.—Richard T. Ringling has applied to the Federal Power Commission for permission to build a 50-ft. dam and a 1-mi. pipe line to the power house to develop 400-hp. in Meagher county.

Salt Lake City, Utah.—The Utah Copper Co. plans to construct an electric generating plant for the operation of its local properties, to have an initial capacity of 60,000 kw.

Tempe, Ariz.—Light and gas bonds to the amount of $135,000 has been authorized by vote. Address the mayor.

Seattle, Wash—The City Council has appropriated $20,000 for the continuation of the development work at the Skagit river. The initial resolution No. 7070 for street lamps was discussed April 25.

Wenatchee, Wash.—Norwood W. Brockett, Seattle, Wash., has applied for a franchise to establish electric power lines along every street and alley in Wenatchee. Electric power will be brought in from Monroe or Ellensburg and an investment of $1,500,000 is contemplated in establishing the service.

Los Angeles (Glendale), Cal.—Plans are now under way for motorizing the Tropico potteries by supplanting steam with electricity. Address F. B. Ortman, manager.

Los Gatos, Cal.—Plans have been prepared for the installation of a complete new lighting system. Address city clerk.

Pasadena, Cal.—Plans are being prepared for an addition to the municipal lighting plant on Glenarm street. Bonds to the amount of $50,000 have been voted for additions to the plant, erecting a building and purchasing a boiler. Address C. W. Koiner, general manager.

Woodland, Cal.—A contract has been entered into by the Woodland City Trustees with the Municipal Improvement Co. of Oakland, Cal., for the construction of an electrolier system in the city and lighting Main street with "Marbelite" standard street lamps from West to East street, at a cost of $21,000.

PROPOSALS

Union City, Mich.—Bids will be received May 15 for the erection of a hydroelectric power house for the village, plans for which have been prepared by Holland, Akerman, Holland, engineers, 106 East Liberty street, Ann Arbor, Mich. Address I. Margensen, village clerk.

Linton, Ind.—Bids will be opened May 10 for the erection of a power and light plant, plans for which have been prepared by Shourds, Stoner & McCormick, architects, 510 Tribune building, Terre Haute, Ind. Address A. J. Miller, mayor of Linton.

Fort Wayne, Ind.—Bids will be opened at 3 o'clock on Monday, May 2, at the office of the Board of Public Works, City Hall, for the following equipment in accordance with specifications now on file in the office of George L. Smith, superintendent, City Hall Annex: Two air compressors, close belted to a-c. motors; two centrifugal pumps, direct connected to a-c. motors, and one air receiver. All motors to be furnished with starting equipment. Bids must be sealed and addressed to the Board of Public Works, Fort Wayne, Ind. The estimated cost of the above is $12,000.

INCORPORATIONS.

New Haven, Conn.—Den-Hart Manufacturing Co. Capital, $50,000. To manufacture electrically operated washing machines. Incorporators: E. W. E. Denis, William R. Hartley and E. C. Smythe, 54 Tilton street.

Pawtucket, R. I.—Battery Engineering Co. Capital, $3600. To manufacture and repair electric batteries and kindred equipment. Incorporators: Fred M. Jordan, Edward H. Taylor and William S. Boice, 580 Commonwealth avenue, Boston.

New York, N. Y.—Risler-Hornung Corp. Capital, $18,000. To manufacture electrical supplies. Incorporators: E. A. Risler, Jr., H. J. Hornung and R. W. Maloney, 305 Broadway.

New York, N. Y.—Multiple Storage Battery Co. Capital, $1,000,000. To manufacture electric batteries and other electrical specialties. The company is represented by Arthur W. Britton, 65 Cedar street.

New York, N. Y.—John P. Morrissey, Inc. Capital, $50,000. To engage in electrical contracting. Incorporators: J. P. and S. A. Morrissey, and G. Wernery, 51 Chambers street.

New York, N. Y.—Robert S. Conlon, Inc. Capital, $10,000. To manufacture electrical equipment. Incorporators: R. S. Conlon, W. F. Davis and E. A. Vosseler, 149 Broadway.

Ridgewood, N. J.—Hall Products Co. Capital, $10,000. To manufacture electrical appliances. Incorporators: George I. Hall, Henry and Runis Amos.

Newark, N. J.—Electric Manufacturing & Sales Co. Capital, $100,000. To manufacture electrical products. Incorporators: Abraham and E. Beller and Herbert Parvin, 128 Market street.

Newark, N. J.—Ampier Service Co. has filed notice of organization to operate an electrical repair plant at 218 North 16th street. Ralph M. Mason, 40 Park street, East Orange, N. J., heads the company.

Newark, N. J.—Ideal Sign Co., 26 Jackson street, has filed notice of organization to manufacture electric signs. Adolph Vasse, 95 Cherry street, Orange, N. J., heads the company.

Philadelphia, Pa.—Rubicon Co. Capital, $20,000. To manufacture electrical devices and equipment. Josef Doerr, Elkins Park, Pa., is treasurer.

Philadelphia, Pa.—American Moving Train Telephone Corp. Capital, $5,000,000. To manufacture telephone apparatus and systems. Incorporators: F. R. Hansell, J. Vernon Pimm and E. M. MacFarland.

Pittsburgh, Pa.—Keps Electrical Supply Co. Capital, $25,000. To manufacture electrical products. M. W. Petre, 50 Carnegie avenue, is treasurer.

Baltimore, Md.—Reiner, Beck & Stewart, Inc. 321 Park avenue. Capital, $15,000. To engage in electrical contracting. Incorporators: Milton Reiner, William H. Beck and Thomas J. Stewart.

FOREIGN TRADE.

[Addresses of firms referred to in these trade opportunities may be obtained by writing to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch and local co-operative offices. Request for each opportunity should be on a separate sheet and the file

Electrical Apparatus (34,632)—A mercantile firm in India desires to purchase and secure an agency for everything electrical, electric passenger and freight elevators, etc. Quotations should be given c. i. f. Bombay or Calcutta. Terms: Part advance through bank; balance against delivery of documents through bank. Reference.

Electrical Supplies (34,592)—An American commercial agent, who has sales and office connections in France, is in the United States and desires to be placed in communication with firms with a view to securing an agency for the sale of electrical supplies, lamps, etc. Quotations should be given c. i. f. Havre, France, or f. a. s. New York City. References.

Electrical Material (34,698)—A builder and contractor in Mexico desires to purchase electrical material. Quotations should be given c. i. f. Mexico. No reference offered.

FINANCIAL NEWS

Comment on the Financial Outlook in the Electrical Industry, New Securities, Reports of Earnings, Dividends and Utility Stocks

Offering of Puget Sound Power & Light Co. Gold Bonds.

A new issue of $13,734,000 Puget Sound Power & Light Co. general and refunding mortgage 7.5% gold bonds, "Series A," dated May 2, 1921, and due May 1, 1941, is being offered at a price of 97.5 and accrued interest, yielding about 7.75%, by Lee, Higginson & Co., Harris Trust and Savings Bank, and Estabrook & Co., Chicago.

The Puget Sound Power & Light Co. owns and operates one of the most extensive and important electric light and power systems in the United State, doing the greater part of the commercial electric light and power business in the Puget Sound district of the state of Washington, including the cities of Seattle, Tacoma, Bellingham and Everett. This system includes five hydro-electric plants with an installed generating capacity of 109,000 hp., and reserve steam plants of 46,450 hp., and an extensive transmission and distribution system. The company, principally through subsidiaries, does a part of the electric railway business in the same territory, except in Seattle, where the street-railway lines are owned and operated by the city, which purchases power from the company.

The net earnings of the company are stated to be over twice the annual interest charges on its bonded debt. The following data gives the earnings and expenses of the company for the years ended March 31:

	1921	*1920
Gross earnings.	$10,140,238.76	$9,225,382.22
Operating expenses and taxes	5,832,598.12	5,596,405.19
Net operating income	$ 4,307,640.64	$ 3,628,977.03
*Income from other sources.	750,000.00	750,000.00
Net earnings.	$ 5,057,640.64	$4,378,977.03
Annual interest requirements of bonded debt (including this issue).	2,299,250.00	
*Balance	$ 2,758,390.64	

*Income from $15,000,000 City of Seattle Municipal Street Railway 5% bonds.

Scranton Electric Co.

	1921.	1920.
January gross	$ 358,509	$ 325,730
Net after taxes	124,690	125,498
Total income	129,617	127,524
Surplus after charges	92,951	91,187
12 mo. gross	3,407,259	2,858,187
Net after taxes	967,693	960,255
Total income	1,031,766	996,569
Surplus after charges	627,726	578,763
Balance after preferred dividends	513,571	514,563

Idaho Power Co.

	1921.	1920.
January gross	$ 184,480	$ 160,873
Net after taxes	87,759	80,573
Total income	99,011	86,597
Surplus after charges	49,328	47,581
12 mo. gross	2,324,221	1,845,789
Net after taxes	1,201,757	900,458
Total income	1,318,673	967,321
Surplus after charges	772,404	504,521
Balance after preferred dividends	687,997	435,321

Stock Issue Planned by Philadelphia Electric Co.

The Philadelphia Electric Co. is arranging for a stock issue of $5,000,000, the proceeds to be used for operation, betterments, etc. The company has issued a report covering the operations during the past year, showing a net income for the 1920 period, available for dividends, of $2,900,258, as compared with $2,639,037 in the previous year. The total commercial connected load increased over the preceding year 1,437,680 fifty-watt lamp equivalent, and that of the railway system and other utilities, 5000 kw. New consumers totaled 33,709, making an aggregate of 157,517 on Jan. 1.

Appalachian Power Co.

	1921.	1920.
January gross	$ 219,668	$ 158,615
Net after taxes	106,160	64,776
Total income	107,326	64,776
Surplus after charges	24,299	*790
12 mo. gross	2,326,663	1,654,518
Net after taxes	1,040,768	781,818
Total income	1,043,101	781,818
Surplus after charges	150,456	47,722
Balance after preferred dividends	129,816	47,722

*Deficit.

United Light & Railways Co.

For the 12 mo. ended Jan. 31, 1921—

	1921.	1920.
Gross earnings	$12,034,490	$10,295,670
Net earnings after taxes	3,276,264	2,948,573
Balance for dividends after interest	1,421,794	1,145,049
Balance after preferred dividends	812,205	540,132

North American Light & Power Co.

Income account for the 12 mo. ending Feb. 28:

	1921.	1920.
Gross operating revenue	$2,913,015	$1,958,112
Balance for dividends	245,929	88,753
Preferred dividends...	72,898	40,898
Surplus	173,031	47,855

Fort Smith Light & Traction Co.

Year ended Feb. 28—	1921.	1920.
Gross earnings	$1,083,702	$ 882,652
Net earnings	296,871	280,632

Mobile Electric Co.

Year ended Feb. 28—	1921.	1920.
Gross earnings	$ 738,877	$ 734,060
Net earnings	220,165	185,647

Southwestern Power & Light Co.'s Subsidiary.

	1921	1920
January gross	$ 995,654	$ 738,748
Net earnings	376,690	351,664
12 mo. gross	9,771,256	6,601,242
Net earnings	3,460,952	2,529,207

American Telephone & Telegraph Co.

For the quarter ended March 31:

	*1921.	1920.
Total revenues	$26,356,782	$25,500,061
Net earnings	18,085,924	17,810,187
Interest	4,993,127	4,757,741
Balance	13,092,796	13,052,446
Dividends	8,868,556	8,839,873
Balance	4,224,240	4,212,572

*Subject to minor changes when final figures for March are available.

Duquesne Light and Subsidiaries.

	1921	1920
February gross	$1,469,054	$1,265,735
Net after Taxes	553,412	469,611
2 mo. gross	3,022,138	2,555,242
Net after taxes	1,100,516	946,503

Mountain States Power Co.

Year ended Feb. 28—	1921.	1920.
Gross earnings	$ 945,104	$ 804,347
Net earnings	295,953	267,304

Dividends.

	Term.	Rate.	Payable.
Am. W.W. & El., pfd.	Q	1.75%	May 16
Brooklyn Edison	Q	$2	June 1
Cities Service, com.	M	0.5%	June 1
Cities Service, com. stk.	M	1.25%	June 1
Cities Service, pfd.	M	0.5%	June 1
Cities Service, pfd.B.	M	0.5%	June 1
Columbia G. & El.	Q	$1.50	May 10
Colo. G. & El.	Q	1.5%	May 16
Edison Elec. Ill. of Boston.	Q	$2	May 2
Idaho Power, pfd.	Q	1.75%	May 1
Lowell Elec. Lt.	Q	2.5%	May 2
Mont. L. & P. Con.	Q	1.25%	May 10
Pac. G. & El., pfd.	Q	$1.50	May 15
Pac. G. & El., 1st pfd.	Q	$1.50	May 61
Pub. Ser. Invt., pfd.	Q	1.5%	May 2
Texas Pr. & Lt. pfd.	Q	1.75%	May 2

WEEKLY COMPARISON OF CLOSING BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Apr. 18.	Bid Apr. 25.
Adirondack Electric Power of Glenns Falls, common	6	11	8
Adirondack Electric Power of Glenns Falls, preferred	6	72	71
American Gas & Electric of New York, common	..	101	101
American Gas & Electric of New York, preferred	6	38	38
American Light & Traction of New York, common	..	87	93
American Light & Traction of New York, preferred	6	82	82
American Power & Light of New York, common	4	52	58
American Power & Light of New York, preferred	6	71	70
American Public Utilities of Grand Rapids, common	..	7½	8
American Public Utilities of Grand Rapids, preferred	7	18	18
American Telephone & Telegraph of New York	..	106	108
American Water Works & Elec. of New York, common	..	4	4½
American Water Works & Elec. of New York, particip.	7	8	7½
American Water Works & Elec. of New York, 1st preferred	..	47	46½
Appalachian Power, common	..	3	3
Appalachian Power, preferred	7	24	25
Cities Service of New York, common	+extra	235	247
Cities Service of New York, preferred	6	67	66½
Commonwealth Edison of Chicago	8	108½	108
Comm. Power, Railway & Light of Jackson, common	..	10	9½
Comm. Power, Railway & Light of Jackson, preferred	6	31	30
Federal Light & Traction of New York, common	..	7	7
Federal Light & Traction of New York, preferred	..	43	41
Northern States Power of Chicago, common	..	47	47
Northern States Power of Chicago, preferred	ex.div.7	80	80
Pacific Gas & Electric of San Francisco, common	..	48	48
Public Service of Northern Illinois, Chicago, common	7	77	77
Public Service of Northern Illinois, Chicago, preferred	6	81	81
Standard Gas & Electric of Chicago, common	..	11	11½
Standard Gas & Electric of Chicago, preferred	8	34½	34½
Tennessee Railway, Light & Power of Chattanooga, common	..	1	¾
Tennessee Railway, Light & Power of Chattanooga, preferred	6	5	5
Western Power of San Francisco, common	..	24	24
Western Union Telegraph of New York	..	90	92
Industrials—			
Electric Storage Battery of Philadelphia, common	4	97	97
General Electric of Schenectady	8	137	138
Westinghouse Electric & Mfg. of Pittsburgh, common	7	48	49